D 110

G. R. S. IX-5]

Previous references.

1795
191 .
(Mund)

Later references.

File No. 237

Serial Nos.

GENERAL AND REVENUE SECRETARIAT.

Serial Nos.

Part B for

SUBJECT.

Water Supply to 6 2 M Station from Hesaraghatta tank

Indexed
HS

W D 88—GPB—50,000—24-7-16

Camp Downe at Mysore from
Nov 10 to 21. 1892.

Mysore on the last mentioned date ~~from Coorg~~ he very kindly
visited the water Supply of Bangr.
evinced great Solicitude for
Satisfactory Early Solution &
ted a joint Scheme and
Cl. my assurance &c.

31 Oct 92

Investigation re
Hessarghatta
as a joint-Scheme
directed.

1 92 th
1-27 Jany 93 th Visited Calcutta, Jaipur
Ajodhia, Agra, Gwalior, where
town was Cantoned by intelligence
of Princes death at Mysore
& the party hurried back to Mysore
where they arrived on 27 Jany 93'

Mr Scal Memorandum 7 10 Jany.
L. Campbell's 26 Jany 93

Hessarghatta & neighbourhood
6 to 16 Feb. 93

note my Minute 18 Feb 93'

Note.

The principal alterations and additions received upon are the following:-

1. Sections 3,4,and 5 about the appointment &c of the President and Commissioners.

2. Section 10 A about the application of items Municipal Funds.

3. Section 34--Enumeration of items of taxation.

4. Sections [illegible] to [illegible]-- The levy of octroi or town duties.

5. Sections [illegible] to [illegible]-- The enforcement of the performance of duty by the [illegible].

6. Sections 99 and [illegible] gives power to Govt: to carry out works of importance to enforce payment of the cost of their construction and [illegible] maintenance from Municipal Funds.

Note. The same matter has to some extent been already dealt with in Sects. 31 and 10 . The necessity for repetition is not clear.

7. Section 195 gives power to the Govt. to execute works outside the town limits.

8. Section 195 A which gives Government and its officers the powers vested in the Board by Sections 193 to 195.

9. Section 197 to 206— Water-supply provisions .

Note. These Sections entirely ignore the Board. This seems inconsistent with certain other provisions in the legislation. There is provision in Section 10A under which such important works can be constructed and maintained by the Board. Under Section 81B, Govt: can undertake them if the Board cannot. This is repeated in greater detail in Section 93. Section 195 provides for the Board doing certain acts in connection with water works outside Municipal limits. Under these circumstances, I do not think it was intended that the Secretariat should so re-draft Sections 197 to 206 as to set aside the Board altogether in the matter of water supply arrangements. Entire recasting of these Sections seems unnecessary. A few verbal alterations seem sufficient with a new Section applying to Government and its Officers the provisions of Sections 197 to 206 mutatis mutandis. The extra charge for house connections has to be left.

Duty of the Water Works Department construct works supply of Water-

Section 197 (1) The Water Works Department shall cause such mains and service pipes to be laid and such Water Work to be constructed, as may be necessary for the supply of pure and wholesome Water sufficient for the use of the inhabitants for domestic purposes in all parts of the Town, provided that the Government of Mysore may, by order in writing, exempt any part of the Town from the provisions of this Section and

any such assumption

ty of Water Works bartment to erect and pipes.

(2) The Water-Works department shall cause such Stand pipes, hydrants, or pumps to be erect-ed at such intervals as the Govern-ment of Mysore, by rules made under these Regulations prescribes, in all the chief streets in which the mains or service pipes have been laid under sub section (1) of this section.

claration of the uplation of the ter Supply Scheme, d the assessment a Water-rate.

Section 198. When the Water Works De-partment shall have carried out a Water Supply

supply Scheme as aforesaid
and such system
shall, in the judgment
of the Government of
Mysore, be complete
the Water Works de-
-partment shall —
declare, by Notifi-
-cation published in
the Official Gazette,
that the supply is
complete and may
thereupon assess a
water-rate upon all
buildings, and premises
within the Town and
not exempted under
Section 197, not ex-
-ceeding four per cent
upon the annual
rental value of the
said buildings and

premises and such Water-rate may, in accordance with the rules to be made by the Government of Mysore, vary within the maximum with reference to the circumstances of different localities.

Provided that in addition to the said Water-rate of four per cent, the Water Works Department may levy a Water-rate not exceeding two per cent on the rental value for each communication-pipe introduced into a house under the provisions of Section 197.

Subject

Subject to rules to be made by the Government of Mysore under Sub Section (2) of Section 197, every owner of an occupied house shall be entitled to lay down one communication-pipe from the mains and service-pipes of the Water Works Department for bringing into his house a proper and sufficient supply of Water for domestic purposes — Provided that the Water Works Department may in its discretion, on the application of a house owner allow one or more additional

communication-pipes with reference to the domestic requirements of the occupants of the house —

The Government of Mysore may by rules

(1) divide the Town into sub-divisions and prescribe the maximum calibre of communication-pipes for each sub division and subject to the maximum calibre so prescribed;

(2) prescribe with reference to the rental value of houses the maximum calibre of the communication-pipe

which each owner of a house in a sub division is entitled to introduce into his house under this section -

Provided that nothing contained in this section shall be deemed to prevent the owner of a house from dividing the communication-pipe to which he is entitled or which he may be allowed to take under this section into branch pipes for the service of various parts of his house -

position and section of Water-rate.

Section 199. The Water rate on Lands

and houses shall be ascertained, imposed, fixed and collected in the manner and subject to the limitations provided by Sections 63 to 90 —

The Water Rate on Communication-pipes shall be levied in the same manner as the Water-rate —

unication-pipes
to be made of
quired dimensions
id at expense of
use-holder.

Section 200. The Communication-pipes leading the water from the mains and pipes of the Water Works Department into the house of any rate payer, and the pipes and works within the house connected therewith, shall be at such

such levels and of such character, dimensions and material as the said Water Works Department, or their proper Officer in their behalf, shall fix and approve, and shall be made, constructed and maintained at the expense of the person requiring the same and must in all cases be execu-ted subject to the inspection and to the satisfaction of the Surveyor or other Officer to be appoint-ed in that behalf by the said Water Works Department — Such communication-pipes and works

may be made by the Servants and Workmen of the Water Works Department subject to such charges as may be fixed by that Department; and it shall be lawful for the Water Works Department to require the amount necessary for the execution of such works to be paid or deposited before such works are executed, and such charges and expenses shall be recoverable in the same way as the Water rate —

that are domestic purposes

Section 201. A supply of water for domestic purposes — shall

shall not include a supply of water for draught animals or for washing carriages where such draught animals or carriages are kept for sale or hire, or a supply for any trade, manufacture or business, or for watering gardens or roads, or for any ornamental or mechanical purpose.

Supply for other than domestic use.

Section 202. The Water Works Department may, from time to time, supply any person with water by measurement for other than the domestic use of the inhabitants for such

remuneration and on such terms and conditions as shall be agreed on between the Water Works De-partment and the person —

Section 203. Not-withstanding any such agreement, a person shall not be entitled to such a supply whenever and as long as the Water Works Department are of opinion that the supply would inter-fere with the proper supply of water for domestic purposes under these Regulations, and the Water Works Department shall not be

be liable, in the absence of express stipulation under any such agreement, to any forfeiture, penalty, or damages for not supplying the water if the want of the supply arises from unusual drought or other unavoidable cause or accident, or the supply has been stopped by the Water Works Department under the former part of this section.

Section 204. Any sum due for water supplied by the Water Works Department

y sum due for
ter supplied by
reement recoverable
a water-rate.

by agreement may be recovered as if the same were a water-rate under these Regulations.

r be cut on leet to rate.

Section 205. If any person supplied with water shall neglect to pay the water-rate at any of the times of payment thereof, or shall waste or misuse the water supplied to him, the Water Works Department may stop the water from flowing into the premises in respect of which such rate is payable, or in which such waste or misuse has occurred,

by

by cutting off the pipe to such premises, or by such means as the Water Works Department may think fit, and may recover the expenses of cutting off the water from such person —

Damaging Works obstructing or diverting Waters.

Section 206. Whoever shall wilfully or carelessly break, injure, or open any lock, cock, main, or pipe, belonging to, or under the management or control of the Water Works Department, or constructed, or continued, or maintained

under these Regulations or shall unlawfully flush, draw off, divert, or take water from any water in works belonging to the Water Works Department or under their management or in control, or from any water or streams by which such water works are supplied, shall, for every such offence forfeit a sum not exceeding 50 Rupees, and a further penalty not exceeding 20 Rupees for each day during which the offence is continued after - written notice in that behalf of -

THE

HESSARAGATTA SCHEME FOR THE WATER-SUPPLY

OF THE

CITY AND CIVIL AND MILITARY STATION

OF

BANGALORE.

No. 4820, dated Bangalore; the 5th December 1895.

From—Captain K. D. Erskine, I. S. C., First Assistant to the Resident in Mysore, Bangalore.

To—The Dewan of Mysore.

With reference to the correspondence ending with my letter No. 4473 of the 8th ultimo, I am directed to address you on the subject of a water supply for the Civil and Military Station, Bangalore.

2. His Excellency the Viceroy during his recent stay at Bangalore took the opportunity of conferring with the Honourable Sir Henry Brackenbury, the Resident and yourself on the subject and it has now been finally decided to abandon the Maligal project and to adopt the Hessarghatta scheme, which promises an ample and assured supply of water, provided that the Darbar will agree to the Civil and Military Station being supplied from that source on terms which will enable the Government of India to carry out the project.

3. It is understood that the Darbar has already raised the old dam at Hessarghatta, and thereby formed a lake which on the 14th November actually contained 615 million cubic feet of water. Further, that the Darbar is erecting the necessary machinery for pumping and constructing reservoirs and laying pipes for the supply of the Bangalore City from this source. On the calculation of the present requirements of the Petta, these works will, it is understood, be capable of providing a surplus of 3,75,000 gallons of filtered water a day. The supply required for the whole Civil and Military Station is, however, calculated to be 10 gallons a day per head of population of 1,00,000 souls, or one million gallons a day.

4. The Government of India therefore asks the Darbar for permission to take a supply of water for the Civil and Military Station of Bangalore from or near the end of the duct leading from the Hessarghatta lake, by means of separate pumping machinery pipes and filters, to be constructed at its own expense. It is understood that the supply of water in the lake is estimated to be amply sufficient for the needs both of the Bangalore City and of the Civil and Military Station, but in view of a possible failure in the supply, temporary or otherwise, it is essential to the scheme that the British Government should be admitted to equal rights with the Darbar in regard to the distribution of the water of the lake. The scheme depends also on the willingness of the Darbar to give the water at a rate not exceeding the rate (Rs. 15 a million cubic feet) which they intend to charge cultivators if water is supplied for irrigation. These two matters which form a *sine quâ non* to the execution of the project were verbally discussed with you, and it is understood that you are prepared to accept both conditions as part of the arrangement. The formal assent of the Darbar to these conditions is now asked for as essential to the scheme.

5. The Government of India propose to pay to the Darbar half the cost of the Hessarghatta delivery channel and aqueducts, so far as these are utilized for the purposes of the water supply to the Civil and Military Station. The estimate for this including the half cost of raising the duct (to be mentioned hereafter) has been roughly estimated at Rs. 75,000. To this the Government of India propose to add Rs. 5,310 on account of half cost of the Darbar's workshops and plant for shops.

6. The cost of water at the rate above mentioned for the 60 million cubic feet estimated to be required for a year's consumption, would amount to Rs. 900 per annum or, capitalising at 4 per cent, Rs. 22,500. This amount the Government of India is prepared to pay to the Darbar. But in regard to this matter I am to make the following more comprehensive proposal. The British Government has paid to the State Rs. 2,33,000 on account of compensation for prohibition of cultivation, &c., in the Maligal valley. If the Maligal scheme is abandoned, it appears probable that the greater part of this compensation can be recovered by restoring the right of cultivating the lands; and the British Government would have felt justified in asking the Darbar to take measures

for such recovery as might be possible and crediting the amount to the British Government. But on the one hand this process would involve a rather troublesome adjustment, and on the other hand the Government of India is prepared to contribute towards the Darbar's expenditure in forming the Hessarghatta reservoir, as the Darbar is being asked to grant to the former equal rights in the water. What is proposed therefore is to assign to the Darbar all claim which the Government of India may have to the recovery of this sum of Rs. 2,33,000, in consideration of the above stipulation, and in payment of a contribution towards the cost of forming the Hessarghatta reservoir and of the capitalised value of water to be supplied, estimated on the present requirements of the Civil and Military Station at Rs. 22,500.

7. If effect is given to the above arrangements, the Government of India will be prepared, from the date on which the Hessarghatta water is brought in to the Civil and Military Station, to forego its claim upon the water of Sankey's Tank.

8. The following is a summary of the terms to which I am now to ask for the formal acceptance of the Darbar.

(1). Equal right's for the Darbar and the Civil and Military Station in the water of the Hessarghatta reservoir.

(2). Permission for the British Government to erect its own pumping machinery, to take off water from the Darbar's channel, and to lay its own pipes through the country intervening between that point and the Civil and Military Station.

(3). Payment to the Darbar by the British Government of Rs. 75,000 being half the cost of the Hessarghatta delivery channel and aqueducts, and Rs. 5,310, half the cost of the Darbar's work shops and plant for shops.

(4). Abandonment of all claim on behalf of the British Government for refund of the Rs. 2,33,000 paid to the Darbar for compensation in the Maligal valley, leaving the Darbar to retain any sums that may be undisbursed, and to recover what it can from the people to whom compensation has been paid.

(5). Abandonment of all claim by the British Government upon the water of Sankey's Tank from the time when the Hessarghatta water is brought into the Civil and Military Station of Bangalore.

9. With reference to the matter of raising the duct from the Hessarghatta reservoir mentioned in paragraph 5 of this letter, it is understood that the existing duct will not be equal to passing a combined supply of water for the Petta and the Civil and Military Station, and that it will be necessary to raise the sides of the duct by at least 18 inches. This would give an increased depth of water in the duct of 15 inches and leave 3 inches for construction of waste weirs at suitable intervals. As the duct has been constructed by the Darbar it would no doubt be best if the raising of the sides in the manner above indicated were carried out by the same agency and the estimated cost of the same has been included in the rough estimate mentioned in paragraph 5. If then the Darbar are prepared to accept the conditions above enumerated the Resident would be glad if this work could be taken in hand at once as it is understood that, when water has once been turned on to supply the Petta, the raising of the walls of the duct will be a matter of considerable difficulty.

10. I am to ask for the favour of a very early reply to this reference.

Residency Press, Bangalore —5-12 95.

DEWAN'S NOTE ON THE HESSARGHATTA SCHEME OF WATER-SUPPLY TO THE CIVIL AND MILITARY STATION AS WELL AS TO THE CITY OF BANGALORE.

[1. Report by Mr. Scaldwell, Executive Engineer of Bangalore, dated 10th January 1893.

2. Preliminary report by Colonel D. McNeil Campbell, Officiating Chief Engineer in Mysore, dated 26th January 1893.]

1. *Introductory.*—The proposed scheme is described in such full detail in the reports above quoted, that my remarks may with advantage be confined to the more salient points requiring careful consideration. Much credit is due to Mr. Scaldwell for completing his preliminary investigation of this important project in the very short time at his disposal and for his excellent report so full of information upon all points. I am very glad also that the scheme as a whole commends itself to an Engineer of Colonel Campbell's ability and experience.

2. *Supply required.*—In my note of the 31st October 1892, directing the investigation of this scheme, I laid down that it should provide a supply sufficient to last for 3 years for a population of 250,000 at the rate of 2 c. ft. per head per day. Colonel Campbell recommends a somewhat reduced supply, namely, that for a population of 200,000 at 10 gallons a day. The present combined population of the Station and the City according to the Census of 1891 is 180,000, being an increase of nearly 157 per 1,000 on the population of 1881. We may reasonably anticipate a more rapid increase of population, as the result of an established water-supply and the connection, now approaching completion, of our Railway system with the East Coast Railway. I therefore think it unwise to provide for less than a population of 250,000. It would also be a mistake to give less than 2 c. ft. per head per day. It is true that the people will for some time continue to resort to existing sources of supply and that, as long as they do so, it might be sufficient to allow 10 gallons per head. But these existing sources in Bangalore are of a nature likely utterly to fail in exceptional seasons like the present, and when such failure happens, the entire supply will be drawn from the proposed system. It is therefore necessary that the scheme should provide a full supply. About 2 c. ft. a day is supposed to be the minimum quantity required for the troops, and though half that quantity has in some quarters been held to be sufficient for the Indian section of the population, yet the habits of the latter are not such as would justify the proposed difference of treatment. I would accordingly assume the supply required at 2 c. ft. per day per head for a population of 250,000, and upon this basis work out the details of the scheme to be immediately carried out.

3. *Storage Reservoirs required.*—In my note of 31st October 1892, I proposed that the waste weir of Hessarghatta, which is the terminal tank across the Arkavati river, should be raised 15 ft., and those of the two tanks above it, *viz.*, Kakol and Byata, should each be raised 6 ft. Mr. Scaldwell's report shows that the proposed enlargement of Kakol and Byata would be attended with undue risk and expense, and that it would be sufficient for the practical requirements of the scheme to include in it the nine minor tanks named by him. This

proposal being accepted, we need only enlarge the capacity of Hessarghatta by raising its waste weir 15 ft., leaving Kakol, Byata and the nine minor tanks above referred to, as they now are. Thus for purposes of storage, the scheme will comprise the 12 tanks, of which particulars are given below :—

No	Name of Tank.	Mean Sea-level of waste weir.	Free Catchment Area in Acres.	Area of water-spread in Acres.	Capacity of Tank in Millions c. ft.
1	Hessarghatta	2,804 17	4,405	336·53	89·556
2	Byata	2,835	4,954	157 59	22·987
3	Kakol	2,834	2,553	320·55	79·896
4	Sonnainhalli ... }		401	18 97	3·113
5	Chikdevarpur ... }		463	16·86	2·090
6	Jumbinkere ... }		990	38·44	6·263
7	Arsinkunte ... } Nine Minor Tanks.		498	14·40	1·082
8	Devarkunte ... }		318	16·84	1·749
9	Shanbhoganhalli... }		490	7 32	0·960
10	Budamanhalli ... }		656	22·14	2·894
11	Arakere ... }		315	3·11	0·406
12	Yettikere ... }		594	66·40	8·681
	Total		16,637 * or nearly 26 Sq Miles	1,019·15	219·677
	Add water-spread and capacity due to enlargement of Hessarghatta to Mean Sea level 2,819·17 ft.			1,365·47	677·781
	Grand Total... ..			2,384·62	897·458

* To this should be added 4·12 Square Miles, being ½ of the partially free catchment area of certain other tanks. (*Vide* Mr Scaldwell's report para 39)

4. *Catchment area available.*—The reports give full information regarding the extent and character of the gathering ground and the run-off which may be expected from it. It is, in my opinion, the best available in the neighbourhood of Bangalore. The drainage area of the Arkavati valley up to the Hessarghatta Tank is 211·78 square miles; of this area 30·41 square miles would be free gathering ground for the 12 tanks in question; the drainage of the remaining area is intercepted by 171 tanks, large and small, whose total capacity is only six-tenths of the run-off of an year of average rain-fall. Assuming the run-off to be only 12 million c. ft. per square mile in such a year, Colonel Campbell calculates (see para 28) that all the 12 tanks proposed to be taken up will readily fill and the terminal tank will discharge over its waste weir between 400 and 500 millions of c. ft. He also calculates that in a very bad year with only 17 inches rain-fall, the tanks in question will receive only 95·79 millions c. ft., a little more than a tenth of their total storage capacity. The Arkavati valley, which drains the south-western slopes of the Nundydroog range of hills and the high lands north and north-west of Dodballapur, may safely be expected to yield, even in bad years, a much better supply than what the above calculation assumes But, for our present purpose, it is sufficient if the tank fills in an ordinary year, for the project is to impound the supply of such a year and make it available for use in a succession of bad years.

5. *Storage capacity.*—The total storage capacity of the 12 reservoirs comprised in the scheme will be 897 millions c. ft This, in my opinion, is sufficient to afford an unfailing supply to the present population of Bangalore, besides leaving a fair margin for the increased population of the next 10 or 20 years. The scheme also possesses a great special advantage in that it admits of large and easy additions to the storage capacity now proposed, whenever found

necessary, either by taking up more tanks higher up in the valley or by a slight further raising of the waste weir of the Hessarghatta Tank.

6. *Sufficiency of the proposed storage.*—Colonel Campbell in para 32 of his report, assuming the most unfavorable condition of rain-fall, known in any one year, to happen in two successive years, shows that the proposed storage, after allowing for evaporation and percolation, would last for about 6 months beyond two such years. This conclusively proves the proposed storage to be practically unfailing, for a third year of drought is one, of which we have no experience whatever and may safely be left out of calculation The two worst years on record are—

1875 with 22 inches and 1876 with 17 inches followed by 1877 with 39 inches.

If we again had the misfortune to have two years like 1875 and 1876, the storage would last through those two years and leave a balance sufficient to last till the plentiful rain-fall of the next or third year.

7. To judge fairly of the sufficiency of the proposed storage, it is necessary to bear in mind the exceptionally favorable situation of the terminal storage reservoir. At the end of every year of ordinary rain-fall, the 12 tanks proposed to be taken up will all be full, and for several months afterwards Hessarghatta will discharge over its waste weir, for, the leakage from the upper tanks, impounding 1,319 millions of c. ft., and the tail water of the cultivation under them would serve to send a considerable * stream into it for several months after the monsoon completely ceases. When its waste weir ceases to discharge, this stream will still flow into the tank to make good its daily loss from evaporation, percolation and supply to Bangalore. When this stream becomes insufficient to keep the tank at its waste weir level, the eleven other tanks will be drawn upon (first the nine minor tanks and afterwards Kakol and Byata) to maintain this level. In this way we may expect to have Hessarghatta full till about the end of March following a year of ordinary rain-fall. If the next year be the worst on record with only 17 inches rain, the run-off from the dry catchment area would be the small quantity of 95·79 millions c. ft., assumed by Colonel Campbell or even less, but as the actual water-spread would be large, any small showers falling upon it would make a very considerable addition to the quantity stored. Calculating in this way and making due allowance for loss by evaporation, percolation and supply and for addition by rain-fall and leakage, it can be shown that the storage capacity proposed would be sufficient for the supply of three successive bad years following an average year. But it is useless to speculate about three successive years with the known minimum rain fall, for, the worst period of which we have any knowledge is, as already stated, one of two years with 22 inches and 17 inches respectively, and this was followed by a year with 39 inches

8. *Quality of Water.*—The Chemical Examiner's report shows the water as now obtained from the valley to be fairly free from impurities. With a system of strict conservancy in the neighbourhood of Hessarghatta, Kakol and Byata, and with proper filtering beds at Bangalore, the quality of the water can readily be made as perfectly pure as the supply to any large town can possibly be.

9. *Capital cost of the Project.*—Adopting the figures given in para 63 of Colonel Campbell's report, the approximate cost of the project may conveniently be distributed as follows among the main heads of Storage, Delivery and Distribution —

* On 10th February 1891 I directed the establishment of proper gauges to measure discharge of this stream in the present season The results will show what we may expect from it in a bad year following a good one.

	ITEMS.	Estimate of probable cost.
	(A). Storage.	Rs.
(1)	Present value of tanks	1,20,000
(2)	Compensation for lands submerged and thrown out of cultivation and for houses which have to be removed	1,00,000
(3)	Enlargement of tank	1,10,000
(4)	Contingencies at 5 per cent	16,500
(5)	Establishment, tools and plant at 24½ per cent on work ...	27,000
(6)	Unforeseen expenses	26,500
	Total (A). Storage.....	4,00,000
	(B). Delivery.	
(1)	Water-tower	38,000
(2)	Masonry Delivery Channel, 23,826 ft. long	1,50,000
(3)	Settling tanks	44,300
(4)	Pumps and Engines	2,00,000
(5)	Rising Cast Iron Main, 8,580 ft long	1,70,000
(6)	Engine house and quarters for Establishment	36,000
(7)	Stand-post	3,500
(8)	Cast Iron Delivery Main, 36,960 ft. long	7,23,000
(9)	Filtering and Service Reservoirs	1,56,000
(10)	Contingencies at 5 per cent	76,000
(11)	Establishment, tools and plant	1,15,000
(12)	Unforeseen expenses...	38,200
	Total (B). Delivery.....	17,50,000
	(C). Distribution.	
(1)	Cast Iron Distribution Main, 36,960 ft long	8,75,000
(2)	Contingencies at 5 per cent	43,750
(3)	Establishment, tools and plant and unforeseen expenses ...	31,250
	Total (C). Distribution.....	9,50,000
	Abstract.	
(A)	Storage	4,00,000
(B)	Delivery	17,50,000
(C)	Distribution	9,50,000
	Total.....	31,00,000

10. It is scarcely necessary to remark that the above estimate will have to be modified in several particulars when the regular scheme comes to be worked out in detail. Taken as a whole however, and for the purpose of enabling us to decide on the merits of the project, the estimate of 31 lakhs is sufficiently accurate.

11. There are however a few points affecting the cost of the project to which I would like to refer in this place.

(1) Whether the waste weir provided for the enlarged Hessarghatta Tank is sufficiently liberal seems to require careful consideration. It may be found desirable hereafter to further enlarge the capacity of this tank and the section of the bund may therefore be designed at once so as to admit readily of such enlargement.

(2) Because the Banavar Hill is not sufficiently high, Mr. Scaldwell proposes to have a stand-pipe 42 ft. high on the top of that hill. Under this arrangement, the delivery main from Banavar to Mantap Hill has been calculated to discharge at the rate of 617·3 c. ft. per minute during 13½ working hours out of 24. It is desirable to investigate whether the pumping station can be established at the foot of Chikbettahalli Hill which is 50 ft.

higher than Banawar Hill. If this is found feasible, we can have a reservoir on the top of Chikbettahalli which will discharge through the delivery main throughout the 24 hours. The distance to Mantap Hill from Chikbettahalli being shorter than from the proposed stand-pipe on the top of Banawar, and the available average head being greater, there will be a considerable reduction in the cost of the delivery main required. On the other hand, the masonry channel from Hessarghatta to the neighbourhood of Chikbettahalli, if at all feasible, will involve difficult and costly work ; but it may be found cheaper in the long run to do this work and save as much as possible in the cost of the iron main.

(3) Supposing that it is decided to have the pumping station at the foot of the Banavar Hill as now proposed, I do not see why it is necessary to resort to a stand-pipe on the top of that hill. Mr. Scaldwell's calculations are apparently based upon the following data :—

Floor of the Service Cistern on Mantap Hill ...	M. S. L.	3,055 ft.
Top of Banavar Hill, 3,097 ft.... ... Height of stand-pipe, 42 ft.	Do	3,139 ft.
Head after deducting 10 ft. for depth of Service Reservoir		74 ft.
Discharge in c. ft. per minute required to give a day's supply of 500,000 c. ft. in 13½ hours		617·3 ft.

By dispensing with the proposed stand-pipe and substituting in its place a reservoir so placed as to obtain a total head of 44 ft., I find we can slightly reduce the diameter of the delivery main and yet obtain the required discharge of 347 c. ft. per minute throughout the 24 hours. If in view of an enlarged supply of the future the diameter of the delivery main is retained at 2 ft., a continuous discharge can be maintained of over 500 c. ft. with a head of 44 ft., and of over 400 c. ft. with a head of only 34 ft.

(4) It also remains to be investigated whether a cheaper scheme cannot be had by making the floor of the Service Cistern at Bangalore at M. S. L. 3,025 ft. instead of M. S. L. 3,055 ft and providing a separate high level distribution to the few places not commanded by the Service Cistern at M. S. L. 3,025 ft.

12. In these and other ways the project may work out cheaper than 31 lakhs, but it is safer to accept this figure for the purpose of our calculation of the funds required.

13. The exact way in which the funds required for capital works should be provided is an important question which has to be reserved for settlement after consultation with the Resident.

14. But there is one item, namely storage, of which the cost may be left out of account altogether, for it is very desirable that the Mysore Government should provide and maintain at its own expense all the necessary works under this head, levying from the Municipalities a moderate price at a rate, to be permanently fixed, per every 10,000 c. ft. or 10,000 gallons of water delivered at the proposed water-tower near the Hessarghatta reservoir. Under such an arrangement, the Darbar will of course be expected to maintain the works in an efficient condition, but without any liability whatever on their part to pay damages or compensation for an interruption

to the supply owing to any accident to the works, the failure of rains or other unavoidable causes. An arrangement of this kind would be in the main in accordance with the practice which prevails elsewhere and notably at Madras where the Red Hills tank is the property of the Government and the water required for consumption in the City is believed to be sold to the Municipality by the Government for a fixed price. It would be very favorable to the Municipalities of Bangalore, for it would relieve them of the responsibility of maintaining and conserving, and when required of restoring, a complex system of storage reservoirs subsidiary to a large existing Irrigation system and liable more or less to the risk of accident owing to their character and situation. It would also secure for the Darbar freedom from interference of all kinds.

15. Excluding, for the reasons above given, storage reservoirs, the capital cost of the remainder of the project (Delivery and Distribution) amounts to Rs. 27,00,000.

16. *Cost of Maintenance.*—The most important question of all is what payments the Municipalities would probably have to make every year for the proposed water-supply. Colonel Campbell in paras 86—92 gives a rough estimate of the working expenses amounting to Rs. 2,55,000 per annum. The various items of this estimate (excluding for the present Depreciation) with my observations upon each are as follows:—

Items	Rs.	*Remarks.*
(1) Interest on capital at 4 per cent	1 24 000 ..	By the exclusion of storage works, the capital cost is reduced to 27 lakhs. Other Municipalities have to obtain their loans at 5 or 6 per cent But for our present purpose, we may calculate at 4 per cent on 27 lakhs=1,08,000
(2) Loss of Revenue ...	5,000 ...	This item may be omitted as it will be included in the price of the water stored.
(3) Establishment ...	2,112 ...	This, in my opinion, is too low and should be raised at least to 7,000.
(4) Fuel and small Stores ...	20,000 ...	This may be accepted.
(5) Repairs at 1 per cent on 31 lakhs	31 000 ...	Repairs to storage works fall upon the Darbar Engines, pumps and pipes cannot require so much as 1 per cent for annual repairs. It would be sufficient if Rs. 6,000 were allowed for this purpose.

17. The total of the items revised as above amounts to Rs. 1,41,000, to which should be added the price of water payable to the State, say, Rs. 25,000. This figure is arrived at on the basis of interest at 4 per cent and repairs at 1 per cent on the assumed capital cost of 4 lakhs, together with Rs. 5,000, loss of revenue. The exact amount payable will of course depend upon the price mutually agreed upon, but it may for our present purpose be put down at Rs. 25,000.

18. The annual working charges, with interest on capital outlay, thus amount to Rs. 1,66,000. This sum represents what the Municipalities have to pay for the water-supply they get in the immediate present.

19. *Other payments required.*—It is however desirable that they should make moderate further payments towards making the water-supply a permanent institution of the place for the benefit of posterity. These payments will be in the nature of contributions towards Sinking and Depreciation funds.

20. *Sinking Fund to repay Capital Outlay.*—This is not included in Colonel Campbell's Estimate, but it is very necessary to provide for it. By paying 1 per cent on the capital outlay (Rs. 27,000 per annum) towards a sinking fund, the amount at the credit of that fund, allowing 4 per cent compound interest, will amount to 27 lakhs in 41·035 years, or a very little more than 41 years. This small payment cannot be felt as unduly burdensome by the Municipalities. Indeed the proposed arrangement, if it can be effected, will be extremely favorable to them, for, by paying a 5 per cent (4 per cent for interest and 1 per cent for sinking fund) they will be enabled to liquidate the entire loan, principal and interest, whereas other Municipalities have to give 5 per cent and even 6 per cent in the shape of interest alone for the loans they get.

21. *Depreciation Fund.*—Colonel Campbell estimates the annual depreciation of machinery at Rs. 14,000 and of pipes, valves, &c., at Rs. 58,000—total Rs. 72,000. I have however been unable to get exact information regarding the probable life of engines, machinery and pipes. It seems difficult to believe that pipes would require renewal in less than 50 years. In the Vehar Water Works, the pipes laid down about the year 1850 are said to be perfectly sound to this day and are not expected to require renewal for many more years. I don't think there are any instances of pipes having had to be renewed in less than 50 years, under conditions of climate and quality of water such as we have in this Province. With modern appliances it is far easier to prevent and to overcome incrustation in pipes, than was the case 50 years ago. Thus all things considered it seems to me to be really useless to provide for the depreciation of pipes, a contingency very remote and uncertain. Their renewal can become necessary only long after the extinction of the capital loan and at a time when the charge could be borne with great ease by the two Municipalities. The case of engines and pumps is no doubt different. Supposing them to require renewal every 20 years, the payment on account of their depreciation need not be more than Rs. 6,700 or say Rs. 7,000 per annum.

22. *Total payments required for the Water-supply and what the Municipalities can afford to pay.*—Under such circumstances, the annual payments required for the joint scheme would be—

	Rs.
Working charges	58,000
Interest	1,08,000
Sinking Fund	27,000
Depreciation	7,000
Total	2,00,000

23. It has always been understood that the British Government would be willing to give a liberal contribution towards the annual cost, on acount of the troops stationed at Bangalore. The probable amount of such contribution is not as yet known.

24. It is however desirable to form a tolerably correct idea of the limit of the additional revenue which the two Municipalities can raise by imposing new taxes and revising existing ones. I am of opinion that any incidence of total Municipal taxation per head larger than Rs. 1—12—0* (including a water tax) will press with undue severity upon the population. The incidence of the existing taxes, properly so called, is already

* The incidence of total Municipal taxation in Madras is about Rs. 1—14—0 and in Poona City about Rs. 1—12—0.

about Re. 1 per head, and an addition of 12 annas to it would give about Rs. 1,35,000 per annum which I regard as the extreme limit of what the two Municipalities may together be able to pay for a water-supply. The proceeds of a joint system of octroi, tolls, wheel and animal taxes may perhaps first be appropriated towards the expenses of the joint scheme; if this be feasible, then the balance, and if this be not feasible, then the whole of the amount annually required may be levied from the two Municipalities in the proportion of their respective ordinary populations for the time being. But the exact method in which the Rs. 1,35,000 per annum or any possibly higher amount of additional Municipal revenue, can be most readily raised, has to be reserved for careful consideration when the pleasure of the Government of India is known on the joint scheme above proposed.

25. *The Enlargement of Hessarghatta as an Irrigation Project.*—But whatever may be the ultimate decision of the British Government as regards the joint scheme, I think it behoves the Darbar to take immediate steps for the enlargement of the Hessarghatta Tank to the extent proposed, if not for the water-supply of Bangalore, at least as an ordinary Irrigation Project, under the following circumstances. A large Irrigation anikat on the Arkavati, several miles below Hessarghatta, has been under the consideration of the Darbar for some time past. It will have to be practically abandoned if the Hessarghatta Tank is to be utilized for the water-supply of both the City and the Station of Bangalore. If Hessarghatta is not used for a joint water-supply scheme, its enlargement would make a better and more remunerative Irrigation project than the proposed anikat. I would therefore cancel the project for the latter work and at once enlarge the Hessarghatta Tank to Reduced Level 65 ft. as proposed for the water-supply scheme. Thus enlarged, it would irrigate some 4,400 acres against a present irrigable area of 322 acres and an *additional* revenue of Rs. 20,000 per annum may therefore safely be expected. In working out the details of the project, it is perhaps desirable to provide a more liberal waste weir of say 400 ft. and to make the front slope of the bund flatter, say 3 to 1 or at least, 2 to 1 and its section such as readily to permit of a further raising of the waste weir at some future time by some 3 or 4 ft. The whole work should be of as high a standard of safety as possible. I believe the present right sluice is in excellent order and would fairly answer for the proposed Irrigation project if supplemented by a new sluice at the left side at about 50′ or so. If the tank is required for the joint water-supply scheme, it would be easy to close the sluices* permanently and build the proposed water-tower. If the joint scheme is given up, we can readily utilize the enlarged tank partly for Irrigation and partly for the water-supply of the City. Thus all considerations point to the great desirability of enlarging the Hessarghatta Tank as above specified and I shall feel obliged if the Chief Engineer will kindly cause the immediate preparation of the necessary estimates in detail for the orders of Government.

* In the actual execution of the work, the sluices should be postponed to as late a stage as possible to permit of a decision regarding the joint scheme which if favorable would dispense with the necessity for them.

K. SHESHADRI IYER,
Dewan.

BANGALORE.
18*th February* 1893.

PRELIMIANRY REPORT ON THE PROJECT FOR SUPPLYING THE CIVIL AND MILITARY STATION AND CITY OF BANGALORE FROM THE HESSARGHATTA RESERVOIR.

INTRODUCTORY REMARKS

1. *The Arkavati River.*—Amongst the voluminous papers connected with the Bangalore Water-supply, the proposal to utilise the waters of the Arkavati river is several times mentioned, the idea being apparently to dam up the river and pump up the water through pipes, but no details were worked out: the proposal to take water from the Hessarghatta Tank situated on that river (Latitude 13° 9′, Longitude 77° 31¾′, see map attached to report) is also referred to but seems to have been abandoned on the score of distance and lift.

2. *Previous investigations.*—The subject of the water-supply has been investigated by several officers and their investigations show clearly that it is absolutely impossible to get a sufficient supply for even the Civil and Military Station alone by gravitation and that pumping must be resorted to.

3. *Existing large catchments.*—It is also shown clearly that to get an unfailing supply in a year of deficient rain-fall the catchment area must be of considerable extent and the only such catchments are that of the Penakini river to the east, and that of the Arkavati river to the west of Bangalore.

4. *Increasing existing catchments.*—Projects have been prepared or proposed for getting large catchment areas nearer Bangalore by means of long contour channels extending to several different water sheds and by buying up series of tanks, but none of them are by any means satisfactory and the two catchments mentioned above are the only ones from which an almost unfailing supply can be obtained; an absolutely unfailing supply is of course an impossibility as with no rain or nearly none, there would be no water, whatever scheme were adopted.

5. *Arkavati and Penakini catchments.*—As regards the two sources of supply, the Arkavati is by far the most satisfactory as it is nearer, higher and contains better water and therefore the Penakini need not be considered.

6. *Dam across Arkavati River.*—To build a dam across the Arkavati river below the Hessarghatta Tank as was proposed by Colonel Vibart, R. E., would be waste of money as the bund of that Tank already forms a dam across the river at a higher level and only wants raising slightly to answer all requirements and it has consequently been settled to use the Hessarghatta Tank as the reservoir of supply.

7. *Instructions given by the Dewan.*—The idea of investigating the Hessarghatta scheme originated with the present Dewan Sir K. Sheshadri Iyer and he wrote a memo of instructions, dated 31st October 1892, giving data on which the investigations were to be made; these were.—

1*st.* The scheme to allow for a population of 250,000 people.

2*nd.* The supply to be 2 c. ft. or 12½ gallons per head per day.

3*rd.* The reservoir to contain a supply for 3 years.

8. *Remarks on the Dewan's instructions—population.*—As regards No. 1, the population in 1881 was 155,857 and in 1891, 180,366, showing an increase of 24,509 or 157·2 per 1,000, so that in 1901, the population will be 208,740 and in 1911, it will be 241,437, therefore in 20 years the figures laid down by the Dewan will not be reached, and though it is advisable to allow for 10 years' increase as it is believed is done in all Water-supply Projects, it does not seem right to tax one generation for the water to be supplied to a future one. It is therefore considered that the supply should be limited to that required for a population of 200,000.

9. *Supply.*—As regards No. 2 data, the supply to be given per head per diem depends on whether the scheme is to be complete in itself or whether it is to supplement the supply received from wells and other sources; in the former case 12½ gallons is none too great but in the latter 10 gallons per head ought to suffice; and as there is no doubt that a good part of the population will still resort to wells, it is thought that only 10 gallons per head should be allowed, and it must be remembered that in most of the water-supply schemes hitherto prepared for Bangalore, the supply for the Native population of the town has been taken at only 6¼ gallons and this should be considered in comparing the cost of this with other projects. It will be well here to quote from the Memo of Colonel Hasted, Chief Engineer, Madras, on the Bangalore Water-supply, in para 6 of which he writes,—"It will be well here to consider the quantity per head per diem that should be provided. In the schemes that have been proposed, this quantity varies very considerably, the highest being 20 gallons and the lowest for drinking purposes alone about 2 gallons. The ordinary allowance in England in non-manufacturing towns is 16 to 20 gallons, but in this country where water is not required for closets or for washing clothes, it may be very much less." Major Kensington says—"In Mysore according to very carefully prepared statistics, the consumption was found to be in 1874, 1¼ gallons a head per diem at the highest estimate. Surgeon E. Nicholson who was for a long time employed as Analyst of waters in Mysore, in his report, dated 13th December 1871, on the water-supply of Bangalore. puts down 3 gallons a head per diem for every man, woman and child as very liberal. The supply provided for the troops in Captain Romilly's estimates, the latest approved by Government, was about 12 gallons per head per diem, and it is considered that a very ample supply will be provided if 2 c. ft. or 12½ gallons are allowed for the troops and 1 c. ft. or 6¼ gallons for the Native population."

10. *Storage.*—As regards the 3rd data, it is not very clear if the Dewan meant that the reservoir was to contain a three years' supply independent of rain falling during that time and including evaporation and absorption, if so, the capacity of the reservoir will have to be enormous (about 1,100 millons c. ft.) and it is considered if it be large enough to contain a 2 years' supply of 10 gallons per head for a population of 200,000 people including evaporation and absorption and assuming that all of these years will be years of the lowest known rain-fall, it will be all that is required.

11. *Mr. Scaldwell's report.*—In accordance with the Dewan's Memo, Mr. Scaldwell, Executive Engineer, Bangalore Division, was ordered on the 2nd November 1892, to prepare a preliminary report on the Hessarghatta Water-supply scheme; and this report which he has prepared with great care was submitted on the 10th January 1893.

12. *Storage allowed by Mr. Scaldwell.*—The supply allowed by Mr. Scaldwell is as laid down by the Dewan, that is, 12½ gallons per head for 250,000 persons or 500,000 c. ft. per day equal to 182·5 millions of c. ft. per annum; but he only allows a storage capacity in the Hessarghatta and other tanks above (to be described hereafter) of 870·22 millions c. ft., which would be about ¾ that required by the Dewan, *vide* para 10.

13. *Storage required for* 200,000 *persons at* 10 *gallons per head.*—Supposing 200,000 people were to be supplied at the rate of 10 gallons (1·6 c ft. per head per-day,) this will require 320,000 c.ft. a day or 116·8 millions c. ft. per year; and the capacity allowed by Mr. Scaldwell would be more than two years' supply without any rain-fall being added.

14. *Mr. Scaldwell's figures adopted in this report.*—In this report Mr. Scaldwell's figures will be adopted, but it will be shown what the results would be if the smaller ones were taken.

BRIEF DESCRIPTION OF PROJECT.

15. *Tanks included in project.*—It is proposed to buy up the 8 lowest tanks of the Hessarghatta series, these are (*vide* Topo. map herewith)—

Hessarghatta.	Chik Devenpur.
Byatha.	Tumbinakere.
Kakol.	Arasinakunte.
Sonnenhalli.	Dyavarakunte.

All these will be left as at present with the exception of the first named (the terminal tank), which will have its weir raised by 15′.

16. *Delivery.*—In three of these tanks, 870·22 millions of c. ft. of water will be impounded, and from the Hessarghatta Tank the supply required for the town will be drawn off and carried 23,826 ft. in a masonry channel to a settling reservoir near Banawar hill, from whence it will be pumped to a stand-pipe 42 ft. high on the top of that hill (level 3,087·64) and from this stand-pipe the water will be delivered by gravitation through a 24″ cast iron main to a service reservoir and filter on mantapam hill, from whence the distribution to the Civil and Military Station and the City will be taken off.

17. *General remarks on project.*—The Project is a simple one in an engineering point of view; the chief points to be considered and discussed before the details are worked out being—

1. Quantity and storage of water available.
2. Quality of water.
3. Cost of Project.

It has been proposed to build the service reservoir at a lower level, the water required for the higher parts of the station being pumped up separately, the average level of the Petta may be taken at under 2,970′ and therefore a reservoir with floor at 2,980 would suffice; but there are many parts of Bangalore above this level, such as the Railway Station and the houses in the vicinity, the Residency, the Palace, the Jail, the Government Buildings, houses in the neighbourhood of St. Marks and St. Andrews Churches, and the High Ground, and a large volume of water would have to be separately pumped and this is not thought advisable owing to the cost.

To command the high parts of Bangalore mentioned, omitting only the High Ground and Railway Station, a service reservoir floor about 3,025 would be required, and it is thought better to pump the extra 30′ once for all than to have separate arrangements.

QUANTITY OF WATER AVAILABLE.

18. *Present and proposed capacity of Tanks.*—In para 6 to para 28 of his report, Mr. Scaldwell has described in detail the present condition of the 8 tanks to be taken up, so it is sufficient here to state that the total capacity of all these tanks is at present 206·736 millions of c. ft., and with the weir of Hessarghatta raised 15′ the capacity will be 884·517 millions c. ft, but the 5 tanks named last in para 15 may be omitted as they are very small and shallow, the total capacity will therefore be 870·22 or say 870 millions of c. ft., which excluding evaporation and absorption is more than the 3 years' supply of 547·5 millions of c. ft. laid down by the Dewan, and would be more than 3 years of the reduced supply recommended in para 10, evaporation and percolation being *included*.

19. *Catchment area.*—The total catchment area of the Hessarghatta Tank and the 183 tanks above it is 211·78 square miles, and the free catchment of the 8 tanks to be taken up is 22·78 square miles.

20. *Extra catchment.*—In addition to this, there is a catchment of 8 85 square miles, *vide* Statement C, attached to Mr. Scaldwell's report, that is free to the extent of $\frac{2}{3}$ of the run-off during ordinary years and $\frac{1}{2}$ during years of minimum rainfall, the capacity of the tanks in that area being so small, that even in the worst years not more than half the run-off can be impounded, therefore 4·42 square miles may be added to the 22 78, giving a total of 27·20.

21. *Additional catchment proposed.*—An additional area of 3·21 square miles may be obtained by throwing out of cultivation the four very unimportant tanks mentioned in Mr. Scaldwell's Statement D. This would bring the total free catchment to 30·41. As these tanks can be bought for very little, it is advisable that this be done.

22. *Rain-fall.*—No reliable rain-fall registers have been kept at any stations in the Hessarghatta catchment. Mr. Scaldwell submits statements of the rain-fall for the last 3 years at Nelamangala, Dodballapur and Yelahanka, but these cannot be depended upon, therefore the figures for Bangalore must be accepted, though judging from the geographical position, it is probable that the rain-fall is greater in the Arkavati valley, and this opinion is borne out by those who have had many years' acquaintance with this valley The average yearly rain-fall at Bangalore may be taken at 35″, the minimum at 17″ and the maximum at 56″.

23. *Run-off from catchment.*—What amount of run-off can be counted on is always a doubtful point, as it depends on the nature of the rain-fall; with a yearly total of 40″ if the rain fell in small showers at considerable intervals, the run-off might be less than with a yearly total of 20″ in which there were two or three heavy downpours. (The percentage of run-off also diminishes with the increase of catchment area.)

24. *Run-off from catchment of Sankey's Tank.*—From the records of Sankey's Tank, the average run-off is about 14 per cent of the rain-fall, while the least is apparently 9 per cent; but there appears to be some error about this last figure, or else it is due to the catchment Channels being out of order, for this small percentage was received in 1888-1890 when the rain-fall was 31·12″ and 34·37″ respectively, while in 1884 when the rain-fall was only 21·67″ the amount received into the Tank was 17 per cent.

Assumed run off from the catchment of Sankey's Tank probably incorrect

25. It has generally been assumed that in the case of Sankey's Tank the amount of run off from 1 square mile of catchment is, 7 millions c. ft. in a bad year, 11 millions c. ft. in an average year and 17 millions c. ft. in a good year, (Vide para 4 of Chief Engineer Colonel Hasted's note on Bangalore Water-supply, dated 14th July 1888, and Colonel Bowen's note on General Fisher's Hebbal Scheme) and these figures have been adopted by Mr Scaldwell in calculating the run-off at Hessarghatta. But they are apparently incorrect, as they mean that in a year of 17′ of rain the run-off would be about 18 per cent, in a year of 35,′ about 14 per cent, and in a year of 56″ about 12 per cent, and this is quite contrary to what is known to be a fact, *viz.*, that as a rule the percentage of run-off is less, the less the rain-fall

Run off assumed in other projects and amount allowed in this one.

26. In many of the water-supply schemes that have been prepared, the run-off has been taken at 13 per cent of the rain-fall in a bad year, and this amount is calculated on both by Mr. Standish Lee and Major Grant, R. E. in the Maligal Project, and taking the nature of the Maligal catchment into account, this figure is probably not too high, but in the case of the Hessarghatta catchment, which is partly cultivated and not steep, 8 per cent is perhaps as much as should safely be allowed in a year of a minimum rain-fall of 17″; this will give a run-off of 3·15 millions c. ft per square mile.

Run-off laid down by Major Kensington from tanks catchments generally and amount calculated on in this project.

27 The late Major Kensington, R. E., who was intimately acquainted with the tanks in the Province, has laid down that the run-off in ordinary years from a catchment similar to that of the Hessarghatta, and which he describes as follows :—

" Red or black soil, porous, cultivated, or scrub jungle, or grass, catchment flat" is 20 per cent." So it will be safe to take 15 per cent or 12¼ millions, say 12 millions as the run-off from 1 square mile. Therefore, during an average year of 35′ rain-fall the total run-off from the 30·41 square miles will be 371·72 millions c. ft, and only 95·79 millions in a year of 17′ fall. The run-off from Sankey's catchment in 92 was 11 millions c. ft. per square mile, rain-fall being 27."

Run off from Kakol Tank catchment, see Mr. Scaldwell's Table F., was also 11 millions c. ft. a square mile, with rain-fall below the average and these are both far in excess of the run off allowed in the calculations in this report.

Supply from upper tanks in an average year.

28. As the capacity of the 8 tanks included in the project is 884 millions of c. ft., *vide* para 18, it follows that in an average year, the supply will not fill them, but it will be seen from Mr. Scaldwell's Table B., the capacity of the other upper tanks in the Hessarghatta series is 5,075 units or 1,319 millions c. ft. and the catchment area being 189 square miles, the run off would be 2,315 millons of c. ft. which would fill all the tanks and leave a surplus of 2,315—1,319 or 996 millions c. ft. to supply the 8 tanks, which will therefore in an average year receive 371·72 + 996 =1,367·72 millions c. ft or $1\frac{1}{2}$ times what is required.

Supply from upper tanks in a bad year.

29. In a bad year however, no surplus can be expected from the upper tanks

Evaporation and percolation.

30. The exact amount of evaporation is impossible to calculate, as it depends on area of water-spread which last depends partly on the evaporation; it may be taken to be the usual amount allowed in this Province which is 6 feet per year. This is $\frac{1}{5}''$ per day. (during the dry month the evaporation will be more, during the monsoons less). The bund of the tank being in good order, the percolation may be assumed to $\frac{1}{7}$th of the capacity of the reservoir. (It is doubtful however if any deduction should be made for percolation as no allowance has been made for rain-fall on water-spread of reservoirs, all of which is effective taking half area of water-spread 17″ rain represents 67 millions c. ft.)

Evaporation, &c., and upper tanks.

31. No allowance is made for evaporation and percolation in the other tanks as water will be drawn off from them as soon as it falls below level of weir in the Hessarghatta, and though there will of course be a certain amount of evaporation and percolation, while the water is being drawn off, this will be more than compensated for, by the tail water of cultivation and leakage from tanks above.

Detailed calculations taking 3 consecutive years of minimum rain-fall.

32. Assuming that the tanks are full after north-east monsoon, say on 1st January 1896, and taking the worst view of this case, that is, that there are 3 years following of 17″ rain only and that water is drawn off for 250,000 people at $12\frac{1}{2}$ gallons per head:—

Water in tank, 1st January 1896	884 517	Millions c ft.	
Drawn off at 500,000 c ft. per day ..	182 500		Do.
Evaporation on half area taken contour 53 & 65	305 483		
Percolation $\frac{1}{7}$th capacity taken do ...	64·473		
	25456		
Balance remaining	332·061		
Add received during the year at 8 per cent of rain fall of 17″	95·790		
Total in reservoir on 1st January 1897	437·851		
Drawn off as above	182 500		
Evaporation on half area taken contours 59 and 50 ..	202 566		
Percolation $\frac{1}{7}$th of do	34 446		
	419 512		
Balance	18·339		
Add received during the year 8 per cent of 17″ ...	95 79		
Water in tank on 1st January 1898	114 19		

And this would be barely a 6 months' supply

From this it will be seen that taking the worst possible view of the case the water will last 2½ years, but if the reduced supply of 116 8 millions c ft in the year were taken, the water would last just over 3 years, the balance on 1st January 1898 being 245·529 millions c, ft.

33. *Detailed calculation taking the 3 worst years on record.*—Now taking a rather better case, that is, with rain-fall of the 3 worst years recorded, *viz*:—

1875	...	...	22″
1876	...	...	17″
1877	...	...	39″

the percentage of run off in the first year may be taken as 10 or 160·86 millions c. ft. on 30·41 square miles.

Water in tank, 1st January 1896	...	...	884 517 Millions c. ft.
Drawn off	...	...	182·5
Evaporation	...	..	305 483
Percolation	...	...	64·473
		Total.....	552 456
Balance	...	..	332·061
Received during the year	...	...	160 860
Water in tank, 1st January 1897	..	...	492 921
Say	...	...	493
Water in reservoir, 1st January 1897		...	493
Drawn off	..	...	182 510
Evaporation	.. ...	...	202 566
Percolation	...	...	34·446
		Total.....	419·512
Balance say		...	63 488 Millions c. ft
Add received during the year 8 per cent of 17″		...	95 79
Water in tank, 1st January 1898 ...		...	159 278

This supply would last about six months or till end of May

34. *Result arrived at.*—From these calculations it will be seen that for the large supply required by the Dewan the project as worked out in Mr. Scaldwell's report will not give a supply for 3 years taking the 3 worst years on record as a basis, but that with the reduced supply recommended in paras 8 and 9, the catchment and storage are sufficient to ensure a supply for over 3 years, even supposing that these were years with a minimum rain-fall of 17″

35. *Ways in which supply can be increased.*—If it is considered that the supply as shown by the foregoing calculations is not sufficient, it can be increased in two ways.—

1st By increasing catchment area

2nd. By increasing capacity of reservoirs.

36 *Increasing catchment area.*—As it has been shown that in ordinary years the amount available for storage will be 1367·72 millions c. ft. which is more than ample, it does seem useless to increase the catchment area without increasing storage In bad years increasing the catchment will have little effect.

37. *Increasing storage.*—To increase the capacity of the Hessarghatta Tank, that is to raise the weirs more than 15′ would not if is thought be safe; so the only alternative is to increase the capacities of the Byata and Kakol Tanks, so that they with the Hessarghatta will store a 3 years' supply or about 1,200 millions c ft It was proposed by the Dewan to raise the weirs of the first two tanks by 6 but this would only give a total storage of 818 145 and to give a 3 years' supply it is probable they would have to be raised 7′

38 *Objections to increasing capacities of Byata and Kakol Tanks*—The objections to raising the weirs of these tanks by even 6 are given in Mr. Scaldwell's report, paras 16, 20 21 and 30, and from what he says it will be seen that it will be dangerous and expensive to increase the capacity of the tanks Another objection is the great amount of loss owing to evaporation, &c., from 3 impounding reservoirs with the Byata and Kakol Tanks left as they are, all the water stored in them will be run into the Hessarghatta reservoir in about 3 months, consequently the loss from evaporation will be trifling; but with the capacity of these tanks increased to about 500 millions c. ft, it will be over 1 year before they empty themselves with the Hessarghatta Tank and the evaporation in that time will be enormous.

39. *Reduced supply recommended.*—There can be no doubt that the storage and catchment counted on in Mr. Scaldwell's report is ample to give an unfailing supply of 10 gallons per head to a population of 200,000 persons, and it cannot be too strongly urged that the project be worked out with this supply as the basis, more especially as this will cause a considerable saving on several parts of the project. At the end of 10 years when the population has increased to 208,000, it will be time enough to think of increasing the storage, but to do so now appears to be a waste of money. One great advantage of this Hessarghatta scheme is that the total catchment being 211·78 square miles, it is capable of being extended to almost any extent by buying up tanks and increasing storage.

QUALITY OF SUPPLY.

40. *Villages on catchment.*—The catchment consists of red soil partly cultivated with dry crops; there are 8 small villages draining into the Hessarghatta Tank, their total population being about 700, the catchment area being about 7 square miles; this represents 100 per square mile, the houses or rather huts in these villages are exceedingly poor and it is thought that if a small amount of compensation per hut were paid and land given outside the catchment, there would be no difficulty in getting the people to settle elsewhere, at the same time it is believed that the amount of impurity received into the tank on account of the presence of these few people in the vicinity will be infinitesimal and it must also be remembered that after leaving the tank the water will be allowed to settle at two places and also filtered.

41. *Cultivation on catchment.*—As regards the cultivation, it is believed that very little if any manure is used, and if it is thought that there are objections on sanitary grounds to crops growing in the catchment, the project must be abandoned as the cost of buying up 30·41 square miles would be prohibitive. It is quite hopeless to expect to get a catchment near Bangalore free from cultivation and habitations and it is not clear why such a condition of things is necessary; if it is necessary all that can be said is that it would be almost an impossibility to carry out a Water-supply Scheme for any large town in this or any other country. Mr. Scaldwell in para 49 of his report has given a quotation from Fanning's treatise on water-supply which is much to the point.

42. *Villages of Byata and Kakol.*—In addition to the villages named, there are two, *viz.*, Byata and Kakol draining directly into the tanks of the same name; the former consists of 150 houses and 522 inhabitants and the latter 107 houses and 331 inhabitants; these villages are too important to be removed but as the Byata and Kakol Tanks will act as settling reservoirs, it is thought the presence of these villages will not be objectionable.

43. *Analysis of Water.*—Specimens of the water taken from Hessarghatta, Byata and Kakol Tanks were sent to the Chemical Examiner and the result of his analysis is as follows:—

Quality.	Byata Tank.	Kakol Tank.	Hessarghatta Tank.
Color	Faint cloud ..	White	Slightly cloudy.
Smell	None	Slightly earthy ...	None.
Taste	None	None	None
Reaction	Neutral	Neutral	Neutral
Lime	Present	Present	Present.
Chlorine	A trace	A trace	Trace.
Sulphuric acid ...	None	None	None
Nitric acid	None .	None	None.
Ammonia	None	None	Trace.
Sulphuric Hyd ...	None	None . ..	None.
Magnesia	A Trace	Trace	...
Total Hardness	25 5 grs of $CaCO_3$ per gallon	15 40 grs. of $CaCO_3$ per gallon ...	19 grs of carbonate of lime per gallon.
Permanent	18 5 Ca Cl 1. magnesia sal's	13 30 Ca Cl. and magnesia salts	13 6 Chloride of Calcium mainly
Removeable	7 0	2 10	5 4
Organic Matter Chlorine .	Represented as .. .		...

Two specimens from each tank were examined, one taken from the tank itself and one from the tank cistern, and the Chemical Examiner says the two specimens are almost precisely the same in each case, except that the latter is a little less hard. The following are his remarks on the water :—

Hessarghatta Tank.—" From the analysis I consider the water to be a good potable one; it might be a trifle less hard, but the total hardness is nothing like sufficient to render it unfit in any way for drinking purposes, it being just a trifle harder than the water in the Kukarhalli Reservoir at Mysore."

Byata Tank.—" The water from the tank may be said to be a good potable one and quite fit for use."

Kakol Tank.—" This water is by far the best of the three samples."

In conclusion he writes " In the event of these tanks being used as water scheme for Bangalore, it is presumed that they would all be conserved, in which case the water would be considerably purer than it is at present."

It will be seen from this that the water of all these tanks is good and quite fit for use and that strange to say the water from the Kakol Tank close to which there is a village, is the best of the three.

The analysis is borne out by the result of inquiries which showed that the people in the villages using the water were healthy.

Of course it will be necessary to conserve the tanks to the extent of preventing people bathing or washing their clothes or cattle in them.

ENGINEERING DETAILS AND COST.

44. *Present Condition of Storage Tanks.*—The present condition of the tanks has been described in detail by Mr. Scaldwell in para 10 to 26. It is therefore only necessary to say that the Byata and Kakol Tanks are in good order and require no additions or improvements and the bund and revetment of the Hessarghatta Tank are very strong, the former being from 20 to 57′ wide at top.

45. *Hessarghatta Reservoir.*—The bund of this will be raised 15′, the revetment being dismantled and earth thrown in front and a puddle wall built throughout its length; the top width of the bund will be 15′, front slope 1½ to 1, and rear slope 2 to 1, the revetment will be strongly rebuilt on 1 ft. thick of gravel backing. F. S. L. or crest of weir being 2,819·17, top of revetment will be 2,825·17 and top of bund 2,829·17, that is, 6 and 10 ft. respectively above F. S. L.

46. *New Escape.*—A bund will be thrown across the channel leading to the present escape which is old and leaky and a new escape 300′ long will be built on the left flank. The old weir will be repaired as the surplus from the new weir will have to pass over it into the Arkavati River. The cost of these works as given by Mr. Scaldwell is—

	Rs.
Raising bund	66,069
New weir	33,543
Repairing old weir	2,020
Total Rs.....	1,01,632

this estimate is believed to be very correct, but to allow for contingencies it may be taken to be as Rs 1,10,000.

47. *Water tower.*—The position of this is shown on the plan, the design has been worked out in detail but may require some modification, but the cost Rs. 37,760 or say 38,000 may be accepted as correct; the total cost of head works will therefore be Rs. 1,48,000.

48. *Delivery Channel.*—There was considerable difficulty in settling the line for this channel and Mr Scaldwell gives a detailed description of what was finally decided upon, but it is possible that a cheaper line may still be found.

The channel is very expensive costing Rs. 1,49,790, say 1,50,000 for a length of 23,826 feet or over Rs. 6 per running foot, and it may be found that a saving can be effected, but the full amount will be entered in the estimate. The channel will have a fall of $\frac{1}{5,000}$ and will deliver 5·787 cubic feet a second running 2′ deep.

49. *Settling Tanks.*—At the end of the delivery channel, there will be 2 Settling Tanks, each holding a day's supply, from which the water will be pumped; the cost of these two tanks will be Rs. 44,286, say Rs. 44,300.

50. *Pumps and Engines.*—These will be fitted up above the Settling Tank just mentioned. The pump will have to lift 5,063·6 gallons or 822·17 cubic feet a minute, 374 feet high through $1\frac{3}{4}$ mile of 24″ internal diameter rising main; calculations for the lift are given in para 59 of Mr. Scaldwell's report, these calculations being based on the fact that it is necessary to have the floor of service reservoir at 3,055 to command all parts of the station. He has allowed pumping $13\frac{1}{2}$ hours a day with an additional 7 hours twice a week; but it would be better if the full supply for 7 days were pumped up in 6 days of 12 hours each, that would give the quantity to be pumped up as 5,063·6, say 5,064 gallons per minute. The Agent of the Worthington Pumping Company, Calcutta, was wired to, to ascertain the cost of suitable pumping engines and a reply was received on the 24th instant, stating inability to give quotation and suggesting a reference to Messrs. Simpson and Co., London. This latter firm has been addressed; but as it will be some weeks before an answer is received, it is not thought advisible to delay this report on that account. It will be noticed from para 81 of Major Grant's report dated 25th April 1892, that that officer received information from the Worthington Pumping Company, from which he estimates that pumps and engines to raise 930 gallons per minute to a height of 424 feet through 6 miles of rising main, will cost Rs. 1,15,000. In this case 5,063 gallons have to be raised to a height of 374′ through 1·6 miles rising main and it is not thought likely that the cost can exceed the 2 lakhs entered in the estimate.

51. *Rising Main.*—This will be laid in a straight line from the pumps to a stand-pipe on the top of Banawar Hill; it will be 8,580 feet in length, 24″ internal diameter and 1″ thick, and the cost will be Rs. 1,57,588, say Rs. 1,60,000. Add Rs. 9,000 for laying and Rs. 1,000 for masonry pillars. Total cost will be Rs. 1,70,000.

52. *Engine House, &c.*—The design for the Engine House and Quarters for establishment have to be worked out in detail; the approximate cost of the former will be Rs. 20,000 and of the latter 16,000.

53. *Stand-pipe.*—The level of the top of Banawar Hill +3,097·64 not being sufficiently high to give the required head over the service reservior on Mantapam Hill, floor of which will be +3,055, it is necessary to erect a stand-pipe 42 feet high; this will be combined with a signal station. The cost of this will be Rs. 3,505, say Rs. 3,500. (If the water has to be delivered in 72 hours, the height of stand-pipe 42′ as allowed by Mr. Scaldwell will not be sufficient, and a height of 70′ will be required; the cost will then probably be about Rs. 5,000 and the lift will be 385′.)

54. *Delivery Main.*—This will start from the stand-pipe at Banawar Hill and run in an almost perfectly straight line to the service reservoir on the Mantapam Hill; the total length will be 36,960 feet, internal diameter 24″ and thickness metal 1″. (See Mr. Scaldwell's detailed calculations, para 66.) It is usual to make 24″ pipes 1″ thick, but it is thought that it would be cheaper to reduce the thickness of metal when the pressure is low and risk chance of breakage in carriage.

	Rs.
The cost at Rs. 7¾ per cwt. will be...	... 6,78,861
To which must be added laying at rupee 1 per foot ...	... 36,960
5 Air Valves at Rs. 200	... 1,000
6 Scour do ,, 150	.. 900
4 Do do ,, 520	... 2,080
6 Reflux Valves at ,, 500	... 3,000
Total.....	7,22,801
Say.....	7,25,000

This is a very liberal estimate and it is believed that the cost will not be more than 6½ lakhs.

55. *Filtering Reservoir.*—There will be three of these, two of which will give a day's supply at the rate of 75 gallons per square foot per day. The details have not been accurately worked out, but the cost will be approximately Rs. 34,000.

56. *Service Reservoir.*—This will contain 3 days' supply; the details have not been accurately worked out, the approximate cost will be Rs. 1,21,733, say Rs. 1,22,000.

57. *Compensation.*—In para 72 of his report, Mr. Scaldwell gives the compensation to be paid on account of land thrown out of cultivation under the Byata, Kakol and Hessarghatta Tanks as Rs. 55,000; to this must be added approximately another Rs. 20,000 for land under the remaining 5 tanks, bringing the total up to Rs. 70,000, as this is only approximate and does not include the tanks mentioned in para 21, it will be safe to take Rs. 1,00,000 as the amount to be paid for compensation.

58. *Present value of Tanks.*—This is given in statement attached to para 27 of Mr. Scaldwell's report and amounts to Rs. 1,04,795: to this has to be added the value of the 4 small tanks proposed to be thrown out of cultivation, *vide* para 21, the total value may therefore be taken as 1,20,000. This estimate was made up at the request of the Dewan, the Mysore Government will not of course have to pay for their own tanks.

59. *Distribution.*—This is taken at Rs. 3½ per head and is what has been allowed in other water-supply projects for Civil and Military Station, the total cost allowing 250,000 people will be Rs. 8,75,000. No attempt has been made to work out the detail of the cost of distribution, Rs. 3½ per head is what has been allowed in other schemes for the supply of Civil and Military Station, but as the City is more compact, it is probable the average cost will be less.

60. *Establishment, Tools and Plant.*—It will be necessary to allow 24½ per cent on all items representing work, in fact on the cost of project less value of tanks, compensation, cost of piping, stand-pipe, rising main and delivery pipe; this amounts to Rs. 1,80,000. This item has not been allowed in any of the projects hitherto prepared except Major Grant's Malligal Project. It seems absurd to suppose that such a large sum will be required for a work that should not last more than 3 years and for which no special machinery or appliances will be required.

61. *Contingencies.*—Five per cent on the total estimate is allowed on this account.

62. *Unforeseen Expenses.*—For this a sum of Rs. 58,200 has been entered on this account. Not allowed in other projects but advisable.

63. *Abstract of Estimate.*—

		Rs.
1	Head Works	1,48,000
2.	Delivery Channel	150,000
3.	Settling Tanks	44,300
4.	Pumps and Engines	2,00,000
5.	Rising Main	1,70,000
6.	Engine House	20,000
7.	Quarters for Establishment	16,000
8.	Stand Pipe	3,500
9.	Delivery Main	7,23,000
10.	Filtering Reservoir	34,000
11.	Service Reservoir	1,22,000
12.	Compensation	1,00,000
13.	Value of Tanks	1,20,000
14.	Distribution	8,75,000
		27,25,800
	Contingencies at 5 per cent	1,36,000
	Establishment, Tools and Plant at 24½ per cent on all items of cost	1,80,000
	Add for unforeseen expenses	58,200
	Total.....	31,00,000
		or 31 Lakhs.

64. *General Remarks on Estimate.*—The estimate is, it is believed, a very liberal one and there is no chance of it being exceeded, on the contrary a saving can probably be effected on items 2, 5, 9 and 14.

65. *Cost per head.*—The cost 31 lakhs seems high and this represents a charge of Rs. 12·4 per head of the population to be supplied and about Re. 1 per gallon per diem, but this compares favorably with many other water-supply projects, *vide* Appendix 7 of Colonel Mullin's report on the Bangalore Water-supply, from which it can be seen that in the case of the Inchalkarangi water works the cost per head was 13·6 per head. In the Jalgaon water works Rs. 13·9 per head, in the Lahore water works 11·5 per head, and in the Secunderabad water works Rs. 4·4 per gallon. It would be interesting if the cost of other water-supply scheme such as Bombay, Poona, Kirki, &c., could be ascertained for the sake of comparison.

COST OF SCHEME WITH REDUCED SUPPLY RECOMMENDED.

66. If the schemes for supplying 200,000 people with 10 gallons a day be adopted, there will be a considerable reduction in the cost of the estimate as follows.

67. *Head Works.*—The cost of head works will then be approximately Rs. 1,40,000 owing to reduction in size of water tower.

68. *Delivery Channel.*—The delivery channel will cost about Rs. 30,000 less or Rs. 1,20,000 as it will only have to discharge 3·7 c. ft. instead of 5·7 c. ft. a second.

69. *Settling Tanks.*—The settling tanks will not cost more than Rs. 30,000 as they need only contain 2,000,000 gallons instead of 3,125,000 gallons, each.

70. *Pumps and Engines.*—The pumps will have to lift 3,240·73 gallons per minute instead of 5,063·6 and they will therefore be cheaper and the price may be taken approximately at Rs. 1,80,000.

71. *Stand-Pipe.*—The stand-pipe will cost say Rs. 3,000 against Rs. 3,500. In this case the stand-pipe will have to be 60′ high and the lift will be 375′.

72. *Delivery Main.*—With the reduced supply the delivery main need only be 20′ internal diameter, for a length of 18,282′ the head may be taken as 360′, the thickness of metal will therefore be 1″, for a length of 18,678′ the head may be taken as 140′ and the thickness of metal will be $\frac{7}{10}$″

The weight per foot of 20″ pipe 1″ thick is 204 lbs. per foot, therefore the weight of 18,282′ will be 1,665 tons and at Rs. 150 per ton cost will be Rs. 2,49,750. The weight per foot of a 20″ pipe $\frac{7}{10}$″ thick is 142 lbs. per foot, therefore the weight of 18,678′ will be 1,184 tons and the cost at Rs. 150 per ton will be Rs. 1,77,600. The total cost of the piping will thus be Rs 4,27,350, to this must be added Rs. 36,960 for laying and Rs. 6,500 for valves, making the total cost of the delivery main Rs. 4,70,810 against Rs. 7,20,000

73. *Rising Main.*—The rising main will be 20″ diameter 1″ thick and will therefore weigh 204 lbs. per foot, the length being 8,580′; the total weight will be 781·4 tons and at Rs. 150 a ton, cost of pipes will be Rs. 1,17,210; add for laying, building masonry pillars, &c., Rs. 9,000; total cost Rs. 1,26,210, say 1,30,000 against Rs. 1,76,000.

74. *Filtering Reservoir.*—The filtering reservoir may be smaller and the cost taken at Rs. 25,000.

75. *Service Reservoir.*—The same amount, *viz.*, Rs. 1,22,000 will be left for Service Reservoir as it is desirable that it should hold more than a 3 days' supply.

76. *Distribution.*—Distribution at Rs 3½ per head will be Rs 7,60,000

77. *Other items.*—The other item will remain as before, the total cost of the reduced scheme will therefore be as follows:—

78. *Abstract of cost of reduced scheme.*—

	Rs.
1. Head Works	1,40,000
2. Delivery Channel	1,20,000
3. Settling Tank	30,000
4. Pumps and Engines	1,80,000
5. Rising Main	1,30,000
6. Engine House	20,000
7. Quarters for Establishment	16,000
8. Stand-pipe	3,000
9. Delivery Main	4,70,000
10 Filtering Reservoir	25,000
11 Service Reservoir	1,22,000
12 Compensation	1,00,000
13 Value of Tanks	1,20,000
14 Distribution	7,60,000
	22,36,000
Contingencies at 5 per cent	1,11,800
Establishment and Tools and Plant	1,30,000
	24,77,800
Unforeseen Expenses, Say	47,200
Total.....25,25,000	
or 25¼ Lakhs	

79. *Results.*—Thus it will be seen that the present population of Bangalore being 180,000, a supply of water at the rate of 10 gallons per head per diem for 200,000 people to last through 3 years of a minimum yearly rain-fall of 17″ can be secured at a cost of 25¼ lakhs, and this being the case, it does not seem desirable to expend 31 lakhs on the larger scheme.

80. *Proportion of Cost.*—Taking 31 lakhs, the proportion to be paid by the British and Mysore Government would be respectively 17·33 lakhs and 13·77 lakhs and taking 25¼ lakhs, the proportion would be 14·03 and 11·22 lakhs.

81. *Comparision of cost with other projects.*—It will be interesting to compare the cost of this project with some others that have been prepared and the following shows the result:—

Mr. Larmini's Malligal.

Scheme cost Rs. 9,79,754.
Supply 668·75 thousand gallons.
Cost per 10 gallons Rs. 14·6.

Mr. DeWinton's Malligal.

Scheme cost Rs. 11,90,000.
Supply 668·75 thousand gallons.
Cost per 10 gallons Rs. 17·7.

Major Grant's Malligal.

Scheme cost Rs. 19,05,050.
Supply 668·75 thousand gallons.
Cost per 10 gallons Rs. 28.

Present scheme.

Cost Rs. 31,00,000.
Supply 3,125,000 gallons.
Cost per 10 gallons Rs. 9·9.

Reduced present scheme.

Cost Rs. 25,25,000.
Supply 2,000,000 gallons.
Cost per 10 gallons Rs. 12·62.

So that it will be seen that as regards cost of supply per gallon the present or Hessarghatta project is the cheapest,

82. *Remarks on other water supply projects of Bangalore.*—Numerous water-supply projects have been prepared for Bangalore and it is believed they have all been finally rejected except the Hebbal and the Malligal.

83. *Hebbal Scheme.*—As it is now proposed to have a joint scheme for the City and Civil and Mililtary Station, Hebbal Tank as a source of supply may be put out of the question as the free catchment area is only $4\frac{1}{2}$ square miles, and the total $12\frac{1}{2}$ square miles, and the supply would be quite insufficient even supposing all the tanks in the series were brought up.

84. *Madigal or Malligal Scheme.*—Major Grant has lately investigated the Malligal scheme and estimates the cost at Rs. 19,05,050.

The objections to this scheme are—

1st the catchment area though a very excellent one both as regards purity and run-off, is only 10 square miles and this would be quite insufficient to give a yearly supply of 182·500 or even the reduced supply of 116·8 million c. ft. during bad years.

2nd. The supply could perhaps be increased by making long and expensive contour channels into other valleys, but even if this were done, the storage would be a difficult matter as several dams would be required and it is doubtful if sites for them can be found, and moreover, these contour channels would drain very highly cultivated land and thus do away with any advantage; the Madigal scheme has over the Hessarghatta as regards purity of catchment.

All things considered, it may safely be asserted that for a joint water-supply scheme the Hessarghatta possesses advantages superior to all others.

85. *Hebbal and Madigal combined.*—It has been suggested that the Hebbal Tank might be used to supply the Civil and Military Station and Madigal valley the City; but even supposing the supply to be sufficient, the united cost would be more than that of the Hessarghatta as follows:—

	Rs.
Cost of Hebbal Scheme *Vide* General Fisher's report and Col. Bowen's note thereon	3,00,000
Value of tanks	1,50,000
Compensation	2,00,000
Distribution	5,25,000
Establishment and Tools and Plant	25,000
Contingencies	59,000
Total....	12,59,000

This estimate is only approximate and is probably below the mark. Cost of Madigal scheme as estimated by Major Grant, R. E., Rs. 19,05,050.

Total cost of the two schemes, Rs. 31,64, 000 against Rs. 31 or $25\frac{1}{4}$ lakhs and it must be remembered that the Hessarghatta scheme supplies $12\frac{1}{2}$ and 10 gallons per head for natives, while the other schemes only allow $6\frac{1}{4}$. It must also be remembered that the working expenses of two schemes will be double or more than double that of one.

WORKING EXPENSES.

86. It will now be necessary to consider the working expenses first taking the larger estimate of 31 lakhs.

87. *Interest on Capital.*—Interest at 4 per cent=1,24,000.

88. *Loss of Revenue on land taken up.*—The yearly loss of revenue under the Byata, Kakol and Hessarghatta Tanks will be Rs 3,118, it is regretted that accurate information cannot be given with regard to the other tanks as it has not been received from the revenue authorities, but as they are all small, it is thought that the total loss cannot exceed Rs 5,000

89. *Establishment.*—1 Overseer to superintend the complete system on Rs 60=720.

1 Reservoir Superintendent and 3 Peons at Hessarghatta to regulate the suppl, and watch the tanks:—

	Rs.
Superintendent, Rs. 20 per month	240
3 Peons, Rs. 18	216
2 Watchmen on Banawar Hill at Rs. 6	144
2 Engine Drivers at Rs. 20	480
2 Stokers at Rs 7	168
2 Coolies at Rs 6	144
Total Establishment....	...2,112

90. *Depreciation.*—Depreciation of machinery, 7 per cent on 2 lakhs (2,00,000) ... ... Rs. 14,000

Depreciation of pipes, valves, &c., including distribution pipes at 4 per cent on (14,50,000)... 58,000

Fuel and small stores 20,000

91. *Repairs.*—Repairs at 1 per cent. 31,000

92. *Total.*—The total working expenses will therefore be Rs. 2,54,112, say Rs. 2,55,000 or about Rs. 1 per head of population taken as 250,000.

93. *Working Expenses on Reduced Scheme.*—Taking the smaller estimate of 25¼ lakhs, the working expenses work out as Rs. 1,86,000 or about annas 14·8 per head for a population of 200,000.

94. *General Remarks on cost of working Expenses.*—This does not appear to be by any means an exorbitant taxation to impose for a good water-supply and what it really amounts to, is that each person will receive 2,190 chatties holding 2 gallons each of pure water a year at a cost of $\frac{1}{130}$ of an anna per chatti or that is, will receive delivered almost at his door 130 chatties or about a 26 days' supply for one anna.

95. *Interest on Capital.*—In case an unfavorable comparison may be made as regards the working expenses of this project as compared with those of others, it may be mentioned that it is believed that in no other case has the interest on capital been added and this is a large item.

96. *Concluding Remarks.*—In conclusion, it is requested that it may be borne in mind that this is only a preliminary report submitted with the object of enabling it to be decided at an early date whether the project should be investigated in detail or not.

97. *Accuracy of Estimates.*—Mr. Scaldwell has worked out the cost of the different items with great care and in considerable detail, but the figures cannot be accepted as absolutely correct, though it is believed that the total will be within a few thousand rupees of the correct amount, and that any errors, there are, will be on the right side.

BANGALORE,
26*th January* 1893.

D. McNEIL CAMPBELL, LIEUT.-COL., *R. E.*,
Secy. to the Govt. of Mysore, P. W. D.

REPORT ON PROJECT FOR SUPPLY OF WATER FOR BANGALORE FROM THE HESSARGHATTA TANK, REGISTERED No. 73, NELAMANGALA TALUK, BY THE EXECUTIVE ENGINEER, BANGALORE DIVISION.

The Dewan of Mysore in his letter of the 31st October 1892, calling for the submission of a report on the proposed project, forwarded a memo giving the scope of the same, from which the undermentioned particulars have been taken :—

2. According to the Census of 1891, the population of the Civil and Military Station is 100,081 and that of the City, 80,285. Total 180,366.

3. When the Census was taken in 1881, the total population was 155,857—the increase in ten years being 24,509, which is at the rate of 157·2 per thousand.

4. With view of meeting the increasing requirements of the Station, provision should be made for the supply of water for a population of 250,000, at the rate of 2 c. ft. per head per day, and reservoir should be of a capacity to store a supply for three years.

5. The source of supply to be the Hessarghatta, Byata, Kakol, Arsinkunte, and Chik Devanpur Tanks, situated in the Arkavati Valley, and to insure ample storage, the Dewan proposed that the weir of Hessarghatta Tank should be raised 15 feet, and weirs of Byata and Kakol Tanks 6 feet.

6. *Locality of Supply.*—The Hessarghatta Tank is situated in Latitude 13°-9′ and Longitude 77°- 31¾′, *vide* Topographical Survey Sheet No. 42. It is the terminal tank of the Hessarghatta series, which consists of 184 tanks and three "kattes," divided into seven sub-series, particulars of which will be found under the heading "Catchment Area."

7. Byata Tank lies 2½ miles to the north of the village of Hessarghatta, and Kokal Tank is situated immediately above the Hessarghatta Tank at a distance of 3½ miles higher up the Arkavati river, across which like the Hessarghatta Tank, it is constructed.

8. Arsinkunte and Chik Devanpur Tanks are very small ones, the former being on the east, and the latter on the west of the valley.

9. In addition to the five tanks mentioned by the Dewan, there are three small tanks, Dyavara Kunte, Jumbirkere, and Sonnainhalli, the former situated on the east of the valley, and latter two on the west, all of which must necessarily be thrown out of cultivation, as they drain directly into the Hessarghatta Tank.

10. *Present condition of tanks forming storage reservoir.*—Hessarghatta Tank, Registered No. 73, Serial No. 187, Nelamangala Taluk—Constructive details are as follows :—

Waste weir on left at R. L. 50·00 or M. S. L. 2,804·17 and 230 ft. in length
Bund R. L. 60·00 and top width from* 10′ to 57′.
Revetment..R. L. 56·00.
Area of tank at R. L. 50·00=16,28,795 square yards.
Capacity at R. L. 50 00=70·684 million c. ft.
Right sluice..R. L. 28·95 or M. S. L. 2,793·12.
Left sluice..R. L. 43·55 or M. S. L. 2,797 72.

---

*NOTE.—Cross bund on right flank, which is only 220 yards in length, is the only portion of bund with top width less than 20 feet.

Bund and revetment in good order.
Right sluice in good order.
Left sluice somewhat leaky.
Weir—some leaks in left flank of body wall and left wing, and apron requires extensive repair.

11. Tank is stated to have been nearly dry last year, but crops were cultivated below it as usual, at time of inspection (8th December 1892) the level of water was ·65 feet below crest of weir and during the year there was 2 feet of water passing over the weir, which discharged at depths varying from 6 inches to 2 feet for sixteen days.

12. To carry out the Dewan's proposal to raise the water level 15 feet, the construction of a new weir on the high ground on the left of the tank will be necessary; and details of work proposed to be done are given in statement relating to the cost of the project.

Byata Tank.—Registered No. 206, Serial No. 182, Dodballapur Taluk.

Constructive details are as follows:—

Waste weir on right at R. L. 52·00 and 102 feet in length M. S. L. 2,835.

Waste weir on left at R. L. 52·00 and 123 feet in length.

Bund....R. L. 61·00 and top width 12 feet.

Revetment... .R. L. 57·00.

Area of tank at R. L. 52·00=762,758 square yards.

Capacity at R. L. 52·00=22·986 million c. ft.

Sluice on left, R. L. 43·88.

Sluice on right, R. L. 47·24.

14. Right weir consists of a rough stone apron, laid at a slope of 1 in 12—a pit 6 feet in depth has been scoured out below the apron, at a distance of 31 feet from it, but as there is an outcrop of rock immediately below the toe of the apron, no damage is likely to occur to the weir.

Left weir in good order, and consists of a masonry body wall, with returns and a rough stone apron 138 feet in length, laid at a slope of 1 in 10—a pit 10 feet in depth has been scoured out in kodi nala, a short distance below the apron, but as there is a reef of rock running between the apron and pit, the erosion of bed of nala does not endanger the safety of the weir.

Bund is in good order but requires turfing.

Revetment in fair order.

Sluice in good order

15. Tank was quite dry last year—on date of inspection (9th December 1892) water was 1 ft below the crest of weir, and in June last, there was a depth of $1\frac{1}{2}$ feet spillage on the weir, from the run-off from the tank's own catchment—when water is passing over the weirs of Amane Madure Tank, situated immediately above, the depth of discharge on the weir of Byata Tank is 3 feet.

16 The raising of the water level 6 feet would necessitate the execution of the following work :—

Construction of a new weir on the high ground on the right flank, for which some heavy earthwork, in the way of draught channel, would be needed; construction of a body wall in front of the left weir with slabbed overfall, which would be very costly owing to the bed of tank, where new body wall would have to be constructed, being 5 feet below crest of present weir

Raising bund to R. L. 64·00 and revetment to R. L. 62·00.

17. *Kakol Tank.*—Registered No. 200, Serial No. 134, Dodballapur Taluk.

Constructive details are given below:—

Waste weir on left at R. L. 53·00 and 212 feet in length M. S. L. 2,834.
Bund R. L. 62·00 and 9 feet in width at top.
Revetment R. L. 62·00.
Sluice on right R. L. 43·41.
Sluice on left R. L. 43·88.
Area of tank at 53·00 (present weir level) 1,551,489 square yards.
Capacity of tank at 53·00=78·845 million c. ft.

18. Bund, revetment, and both sluices in good order. Weir on left consists of a masonry body wall and rough stone apron 92 feet in length (laid at a slope of 1 in 6) with masonry toe wall and slab binding walls—the left sluice passes through the apron, and tunnel in connection with it forms a masonry binding wall for apron—the weir is in good order, but the ground below the toe wall has been scoured out 4 feet in depth for a distance of 150 feet, and extension of apron throughout this length is necessary, and will be put in hand shortly.

19. Tank was dry last year—at time of inspection (10th December 1892) water was within 6″ of crest of weir, and on the 30th of September, 3 feet of water was passing over it—the discharge over the weir during current year varied from ½ inch to 3 feet in depth for 33 days.

20. The undermentioned work will be necessary in connection with raising the water level 6 feet.

Construction of body wall in front of the weir with slabbed overfall.

Raising bund to R. L. 67·00 and revetment to the same height.

The construction of new body wall will be very costly, as the bed of tank on right flank, where it must be constructed, is 5 ft. below the crest of present weir; but there is not, I think, any alternative, as even if a new weir was constructed on the high ground to the left of the present kodi, the apron would have to be carried down to the level of toe of present apron, and construction of such a weir would prove much more expensive than that of a body wall in front of present weir.

21. In connection with the raising of weir level of this tank, I would beg to bring to notice that from the plans showing the work executed in connection with the restoration of the tank in 1877-78, it would appear that the bund was very badly breached in places, and it is to be feared that raising the weir 6 ft. in addition to the 3 ft. which it has already been raised, will possibly prove disastrous.

22. *Somanhalli Tank.*—Registered No. 211, Serial No. 136, Dodballapur Taluk.

Constructive Details.

Weir on right at R. L. 50·00 and 50 ft. in length.
Bund at R. L. 54·50 with top width of 4½ ft.
Revetment ...R. L 54·00
Sluice ...R. L 43·50
Area of tank at ...R. L 50·00=91,843 square yards.
Capacity of tank at ...R. L 50·00=3·113 million c. ft.
Bund and revetment in good order.
Sluice leaky.

Weir consists of only a rough stone apron 12 ft. in width, which should be extended 20 ft., as kodi nala has cut back to a depth of 3½ ft., within 40 ft. of apron.

Tank quite dry at time of inspection, the water stored during the year having only sufficed for cultivation.

23. *Chik Devanpur Tank.*—Registered No. 210, Serial No. 183, Dodballapur Taluk.

Constructive Details.

Weir on right at R. L. 50·00 and 36 ft. in length.
Bund at R. L. 54·50 with top width of 4½ ft.
Revetment at R. L. 54·00.
Sluice ... R. L. 46·31.
Area of tank at R. L. 50·00=81,621 square yards.
Capacity at R. L. 50·00=2·090 million c. ft.
Bund in good order.
Revetment bulged somewhat in places, but in fair order.
Sluice leaky and requires repair.

Weir—consists of a few rough stones laid as an apron—a masonry body wall 36 feet in length, with returns, and rough stone apron 12 feet in width wanted.

Tank dry at time of inspection, all the water stored having been used for cultivating.

24. *Jumbinkere Tank.*—Registered No. 71, Serial No. 186, Nelamangala Taluk.

Constructive Details.

Weir on left at R. L. 50·00 and 101 feet in length.
Bund at R. L. 54·50 and top width 4½ feet.
Revetment at R. L. 53·00.
Sluice at R. L. 42·58.
Area of tank at R. L. 50·00=186,088 square yards.
Capacity at R. L. 50·00=6·263 million c. ft.
Bund, revetment and sluice in good order.

Weir—consists of masonry body and toe walls with rough stone apron 24 ft. in width—ground below the weir scoured out to a depth of 3½ ft., by a water course on left flank that enters the kodi nala just below the apron—scour will not damage weir, as there is rock and laterite immediately below the toe wall.

Tank dry at time of inspection, as water stored proved only sufficient for cultivation. From marks on gauge stone it would appear that there is frequently a discharge of 3 feet in depth on the weir.

25. *Arasinkunte Tank.*—Registered No. 204, Serial No. 2, Dodballapur Taluk.

Constructive Details.

Weir on left at R. L. 50·00 and 36 feet in length.
Bund at R. L. 54·50 and 4½ feet in width at top.
Revetment—none, as front slope has been made 3 to 1 and turfed.
Sluice at R. L. 46·33.
Area of tank at R. L. 50·00=69,696 square yards.
Capacity at R. L. 50·00=1·082 million c. ft.

Bund is somewhat eroded at weir level, owing to neglect of renewal of turfing.
Sluice in good order.

Weir consists of rough stone apron and masonry toe wall. Kodi channel has cut back and caused the collapse of the toe wall and displacement of the whole of the apron which is 15 ft. in width. A masonry body wall 36 ft. in length, with returns, and apron 30 ft. in width, carried down to bed of nala, is needed.

Tank dry at time of inspection, the water stored having proved hardly sufficient for cultivation.

26. *Dyavarakunte Tank.*—Registered No. 205, Serial No. 1, Dodballapur Taluk.

Constructive Details.

Weir at R. L, 50·00 and 25 ft. in length.

Bund at R. L. 54·50 with top width of 4½ ft.

Revetment—none, the front slope having been made 3 to 1, and turfed.

Sluice at R. L. 46·00.

Area of tank at R. L. 50·00=81,544 square yards.

Capacity at 50·00=1·749 million c. ft.

Bund—front slope eroded at weir level owing to neglect of renewal of turfing.

Sluice in good order.

Weir is a natural one, and no work is needed to it.

Tank dry, the water stored having proved only sufficient for the cultivation, notwithstanding half of the cultivable area below the tank has been taken up for suarina plantations.

27. The annexed statement gives the approximate value of the eight tanks, comprising the project as they now stand:—

Statement of present value of eight Tanks comprising the Hessarghatta Project.

Serial No.	R. No.	Name of Tank.	Storage.				Distribution.		Silt Dams.	Total.	Expenditure subsequent to 1876.	Grand Total.	Remarks.
			Earth work to bund.	Revetment.	Tank waste weir.	Total.	Tank-sluice.	Total.					
1	205	Dyavarakunte ...	1,009	391	...	1,400	...	..	...	1,400	624	2,024	
2	204	Arsinakunte ...	858	281	94	1,233	160	160	...	1,393	563	1,956	
134	200	Kakol Tank ...	11,729	4,471	2,989	19,189	727	727	61	19,977	18,082	38,059	
136	211	Sonnainhalli Attikunte ...	1,067	834	133	2,034	244	244	..	2,278	346	2,624	
182	206	Byata Tank ...	6,687	2,287	1,708	10,682	199	199	...	10,381	1,952	12,833	
183	210	Chik Devanpura Tank ...	1,107	803	...	1,910	202	202	...	2,112	237	2,349	
186	71	Jumbinkere ...	1,628	759	618	3,005	302	302	...	3,307	941	4,248	
187	73	Hessarghatta Tank ...	14,768	10,440	1,014	26,222	1,239	1,239	...	27,461	13,241	40,702	
								Total Rs..		68,809		1,04,797	

28. *Storage Reservoir Capacity.*—From the statement given below, it will be seen that the present capacity of the eight tanks included in the project is 206·736 million cubic feet, and that after raising the weir of Hessarghatta Tank 15 ft., and weirs of Byata and Kakol Tanks 6 ft., the capacity will be increased to 1047·170 million c. ft. The Sonnainhalli, Chik Devanpur, Jumbinkere, Arsinakunte and Dyavarakunte are very shallow tanks, and their capacity, with the exception of that of Jumbinkere, should I think be omitted when considering the question of storage, as the water stored in them would be lost by evaporation and percolation by the close of the year.

Name of Tank.	Present weir level.	Area of water-spred in acres.	Capacity in m.c.ft.	Proposed height of weir.	Approximate area of water-spread in acres.	Approximate capacity in m. c. ft.	Remarks.
Hessarghatta ...	50·00	374	89·556	65·00	* 1702	*767·337	Water-spread and capacity of all the tanks at R. L. 50·00 and 53·00 have been taken from the serial plans and water-spread and capacity at R. Ls. higher than 53·00 have been computed from that data. * Contour survey at R. L. 65·00 since taken and area of water-spread and capacity found to be 1,702 acres and 767·337 m. c. ft.
Byata ...	52·00	157·59	22·986	58·00	302	85·639	
Kakol ...	53·00	320·55	79·897	59·00	44·7	179·895	
Sonnainhalli ...	50·00	18·97	3·113	50·00	1897	3·113	
Chik Devanpur ...	50·00	16·86	2·090	50·00	16·86	2·090	
Jumbinkere ...	50·00	38·44	6·263	50·00	38·44	6·265	
Arsinakunte ...	50·00	14.40	1·082	50·00	11·10	1·082	
Dyavarakunte ...	50·00	16·84	1·749	50·00	16·84	1·749	
Total.. ...		957·65	206·736	...	2,556·51	1,047·170	
Total of Hessarghatta, Byata and Kakol tanks with weirs of former raised 15 ft. and those of two latter tanks 6 ft. ...					2,451	1,032·871	
Total of Hessarghatta with sweir raised 15 ft. and of Byata and Kakol with weirs at present level					2,180	870·220	

29. *Quantity of water to be stored.*—To store a supply of water for 3 years, at the rate of 500,000 c. ft. per day, a reservoir of capacity of 547·500 m. c. ft. is required, and as the Hessarghatta Tank alone, with weir raised 15 ft., will store 219·837 m. c. ft. and with Byata and Kakol Tanks at present weir level 322·720 m. c. ft. in excess of this quantity, I would submit that storage reservoir should be restricted to Hessarghatta Tank with weir raised 15 ft., and Byata and Kakol Tanks at present weir level.

30. *Grounds for recommending restriction of storage reservoir.*—1st. Unnecessary, as during ordinary years there will be a constant supply from the tail water of the numerous tanks above, which will replenish quantity used and lost by evaporation for some time, and probably keep the Tanks full up to end of January.

2*nd*. The raising of the weirs of Byata nnd Kakol Tanks 6 ft., would cause the submersion of about 88 acres of wet, and 183 acres of dry land, which at Rs. 75 * and Rs. 36 * per acre, respectively, would amount to Rs. 13,005 which sum, together with the cost of work in connection with the raising of the weir (approximately Rs. 50,000) would be more advantageously expended on payment of compensation for land thrown out of cultivation under other tanks, (which will be hereafter mentioned) with view of increasing the catchment area.

3*rd*. The raising of weir of Kakol Tank 6 ft. in height is considered inadvisable for reasons given in para 21 of this report.

31. *Percolation and Evaporation.*—The present bund of Hessarghatta Tank is strong and sound, and there is very little percolation. The bed of tank consists of clay, and ground on both flanks of red loamy soil, with decomposed gneiss underlying it, at a depth of 8 feet below surface ; consequently, if excavation of pits within the margin of future waterspread is prohibited, and a good puddle wall carried down 3 feet below silt level at toe of present bund, also the usual precautions are taken with the extension of bund on both flanks, it is believed the loss attributable to percolation will be very small, certainly not more than 15 per cent of quantity stored.

* From enquiries made with regard to land recently sold, these rates are believed to be fair average ones.

32. Allowing as usual 6 feet loss per annum on account of evaporation, the quantity of water available in the reservoir towards the close of the first year, supposing all the tanks comprised in the project to have been full to start with, and no run-off to have been received during the South-West Monsoon, would be 245·655 m. c. ft. as per details given in annexed statement :—

Contour.	Area in acres at contour.	Capacity in M. C. ft. at contour	Capacity in units at contour.	Remarks
50·00 ..	374	89 817	344	Area and capacity at the several contours are based on area and capacity at 50 00 and 53 00 as actually surveyed
53·00 ..	508	148 303	568	
56 00 ...	905	256 658	983	
59·00 ...	1,171	392 428	1,503	
62·00 ...	1,436	562·402	2,154	
65·00 ...	1,702	767 337	2,939	

Percolation at 15 per cent of capacity of reservoir .	115·098 m. c. ft
Annual consumption at 500,000 c. ft. per day	182 500
* Evaporation allowing 6 feet in depth per annum	340 209
Total	637 807
Total Capacity of Reservoir	767 337
Balance	129 530
† Add quantity stored in the other seven tanks .	116·125

Water available in reservoir at end of first year under conditions stated in para 32, 245·655 m c. ft.

* Evaporation has been calculated at 6 feet in depth on the mean area between 56 00 and 65 00.

† No deduction on account of percolation and evaporation has been made from storage of other tanks, as the percolation would find its way into the Hessarghatta Tank, and the evaporation would be very little, as water would be run out of the tanks immediately the level of water in the Hessarghatta Tank fell below the weir

33. In the above calculations no allowance has been made for the tail water from cultivation and percolation from tanks situated above the Hessarghatta Tank, (which is undoubtedly a large quantity, as notwithstanding 65 m. c ft. of water (over two-thirds of capacity of tank) is used annually for cultivation, yet the tank is generally half full at the end of the season during years of ordinary rain-fall.

34. *Catchment Area—Extent.*—The total catchment area of the Hessarghatta Tank, and the 183 tanks situated above it, is 211 78 square miles, (*vide* Statement B) of which the catchment area 22 78 square miles (see Statement A) of Hessarghatta, Byata, Kakol and the five minor tanks comprised in the project is free.

Statement A, showing catchment area, capacity, area of cultivable land, assessment, &c., of eight tanks comprising project.

Serial No.	Name of Tank.	Catchment area in acres.	Present capacity in units.	Cultivable area and assessment as per Revenue Survey statement						Area under cultivation and revenue realized during 1891-92.						Average revenue realized during past 10 years.	Remarks.
				Wet land.	Assessment.	Garden.	Assessment.	Total.	Assessment.	Wet land	Revenue	Garden.	Revenue.	Total.	Revenue.		
187	Hessarghatta ...	4,405	344	211·33	1,233—12	110·19	628-4	322·12	1,862	202·27	1,216	110·19	628—4	313·6	1,844-4	‡ 1,095 11 8	‡ Actual amount realized was only Rs. 1,344—9—0.
182	Byata ...	4,954	88	227·22	1,486	5·95	48	233·17	1,534	75·18	492–12	10 17	77—8	* 85·35	574	612 4 10	*Not $\frac{1}{4}$th cultivated.
134	Kakol ...	2,553	305	351·22	2,244—8	12·9	53-8	363 3	2,298	123·33	791—8	11·20	50—12	†135·3	842·4	963 4 10	†Little over $\frac{1}{3}$rd cultivated.
136	Sonnainhalli ...	401	12	50·13	251	1·36	15	52 9	266	44·9	220	1·36	15	46·5	235	152 0 0	
183	Chikdevanpur ...	463	8	32·27	173	2·13	19	35	192	27·37	142	2 13	19	30·10	162	92 0 0	
186	Jumbinkere ...	990	24	...	...	...	...	...	...	...	...	...	...	...	..	...	
1	Devankunte ...	318	6·7	25· 6	112	6·24	12	31·50	124	25·6	122	6·24	12	31·30	124	60 0 0	
2	Arsinkunte ...	498	4	19·29	82	1 29	3	21·18	85	19 29	82	1·29	3	21·18	84	47 0 0	
		14,582 or 22·78 square miles.	791 7 or 206·736 m. c. ft.														

From this statement it appears that only $\frac{10}{11}$ of the cultivable land, below the 8 tanks is occupied, the calculation of compensation payable for land thrown out of cultivation by submersion, &c., has been restricted to the actual area on which assessment is now paid. The remainder of the land is valuable as pasturage and would be gladly taken up by the raiyats at a reduced rate for cultivation of other than wet crops

Statement B, showing capacity and catchment area of all tanks in the Hessarghatta Series.

Name of sub-series.	Number of tanks in sub-series.	Serial Numbers of tanks in sub-series.	Capacity in units.	Catchment area of tanks in acres.	Cultivable area below tanks.	Situation of sub-series with reference to the Hessarghatta works.	Remarks.
Byata	55	1 to 2 & 135 to 187	2,374·1	46,229	4,535	North-West.	In this sub-series, the run-off from the catchment of 38·52 square miles would be 269·64 m. c. ft. (1,032 units) during a year of minimum rain-fall; so that even during a bad year, more than half the catchment may be considered free.
Kolatur	39	3 to 41	471	24,651	1,326	North-East.	
Nagankere	35	47 to 81	1,045·8	23,494	2,749	Do	
Jumbinkere	16	84 to 99	605·2	13,398	1,283	Do	
Arlamallige	25	100 to 124	1,074·4	17,775	1,975	North-West.	
Kakol	10	125 to 134	228·3	6,490	530	North-East.	
Minor tanks	4	42, 45, 46, 83	68·3	3,497	277	...	
Total.....	184	...	5,867·1	135,534	12,675		
Deduct catchment and capacity, &c., of eight tanks included in project (see statement)			791·7	14,582	1,115		
Balance.....			5,075·4	120,952 or 189 sqr. miles.	11,560		

Allowing [illegible] m. c ft. per sq. mile as minimum run off, the supply from 189 sq miles would be 1,296 m. c. ft. or 4,963 units, which would hardly fill the tanks, the capacity of which is 5,075 units.

With an average run-off of 11 m c. ft per sq. mile, the total supply would be 2,179 m. c ft. or 8,345 units, and surplus would be 3,270 units or 853·785 m. c ft.

With [illegible] run-off of 17 m c ft. per sq mile, the surplus would be 7,170 units or 1,861·618 m. c ft, which is upwards of three times the capacity of the whole of the eight tanks comprising the project.

35. In addition to the above free drainage area, the catchment area 8·8! sqr. miles of the 12 tanks situated in the vicinity of the Hessarghatta Tank (noted in Statement C) is really free to the extent of the $\frac{2}{3}$rds of the run-off during average years, and $\frac{1}{2}$ during years of minimum rain-fall, the tanks situated within that area being so small compared with the catchment that not more than $\frac{1}{3}$rd of the run-off during ordinary years can be impounded.

Statement C of tanks draining into Kakol and Byata tanks, the catchment area of which is practically free to the extent of $\frac{2}{3}$rds of the run-off during years of average rain-fall and $\frac{1}{2}$ during years of minimum rain-fall.

Serial No.	Register No.	Name of Tank.	Taluk.	Catchment area in acres.	Capacity of Tank in M. C ft.	Cultivable Area.	Remarks.
			North of Byata Tank.				
137	209	Sheresandra	Dodballapur	899	8,113,041	79	Capacity of tank only sufficient for cultivation of 32 acres as a Vaisakha crop.
181	310	Kodihalli	Do	407	5,334,768	45	Do 20 do
180	317	Kallodakere	Do	300	2,999,160	30	Do 12 do
179	318	Kalloda Ané	Do	300	1,290,249	11	Do 5 do
...	46	Iyankatte	Do	381	...	17	
178	47	Matta Gaudanakere ...	Do	281	2,683,233	22	Do 10 do
			North of Jumbinkere Tank.				
184	319	Mestri Palya ...	Dodballapur	253	288,468	3	
185	70	Elchalahalli ...	Nelamangala ...	380	769,419	23	Do 3 do
			North of Somanahalli.				
135	213	Karlapura Palya ...	Dodballapur	652	3,047,031	27	Do 12 do
			North of Kakol Tank.				
131	214	Nellikere	Dodballapur	402	1,613,709	8·8	Do 6 do
132	234	Chellahalli Palya ...	Do	516	3,632,904	62·8	Do 14 do
133	200	Aiyan Ané Harur ...	Do	896	3,979,393	77·2	Do 15 do
			Total.....	5,667 or 8·85 sq. miles.	33,751,375 or 129·26 units.	405·8 acres.	

36. With reference to run-off from other tanks, I would here mention that the whole of the Kolatur sub-series is similar in this respect, the catchment area being 38·52 sq. miles, from which a run-off of 269·64 m. c. ft. (1,032 units) could be anticipated during a year of scanty rain-fall, while the capacity of the 39 tanks comprised in the sub-series is only 471 units—the tanks however are very much scattered and at a long distance from Hessarghatta; consequently it has been considered advisable to deal with the surplus run-off from Kolatur sub-series, in the same way as with the other sub-series.

37. A further free catchment area of 3·21 sq. miles might be obtained by throwing out of cultivation the wet land below the four tanks mentioned in Statement D; and if project is carried out, I would strongly recommend this being done, as the free catchment area mentioned in paras 34 and 35 is insufficient during years of minimum rain fall when no surplus is available from the numerous tanks above.

Statement D. Tanks which might be taken up to increase the catchment area.

Serial No.	Register No.	Taluk.	Name of tank.	Catchment area in acres.	Capacity of tank in C. ft.	Cultivable area below tank.	Remarks.
			Tanks west of Kakol.				
3	172	Dodballapur...	Shanbhoganhalli ...	490	960,120	28	
4	227	Do	Bandamaranhalli ..	656	2,893,995	32	
6	225	Do	Bandamaranhalli Orrikere ...	315	405 566	39	
7	199	Do	Yalhkere ...	594	8,680,851	70	
			Total.....	2,055 or 3·21 sq. miles.	16,586,532 or 63·52 units.	169	

38. With reference to the surplus from tanks situated above the tanks comprised in the project, the statement marked B, annexed, shows pretty clearly that 853·785 m. c. ft could be anticipated during ordinary years, while during seasons of draught, the run-off would hardly equal the capacity of the several tanks.

39. From the foregoing it will be seen that the free catchment area, providing the four tanks noted in Statement D are thrown out of action, amounts to 25·99 sq. miles, to which during years of minimum rain-fall, half the catchment area 4 41 sq. miles of the 12 tanks shown in Statement C should be added. This gives a free gathering ground of 30·4 sq. miles during the worst years which are really the only ones that need be considered with reference to the project, as during ordinary years the surplus from tanks above would be much more than sufficient to fill the whole of the tanks comprised in the project.

40. *Run-off from Catchment.*—For the Rachenhalli project, Mr. W DeWinton has allowed 13 per cent run-off during a good year, which is equivalent to 20 908 m. c. ft. per sq. mile, from a rain-fall of 36."

Major S. Grant, R. E., assumes that the yield from the Maligal catchment would be 13 per cent for a very bad year with a rain-fall of 17"—25 per cent for mean year with a rain-fall of 36," and 40 per cent for a very good year with rain fall of 56"—the run-off per sq. mile based on these assumptions would be 5·134, 20·908 and 52·039 m. c. ft.

41. The records of the Bangalore Water-supply Reservoir show that the actual run-off per sq. mile has been as follows:—Minimum 7 m. c. ft., average 11 m. c ft , and maximum, 17 m. c. ft.—during the current year, which, notwithstanding the very rain-fall, amounted to 27·03," is admitted to have been a bad one, the run-off was 11·598 m. c. ft. per sq. mile=18·3 per cent.

42. Of the catchment area of 30·4 square miles, mentioned in para 38, the 3·12 square miles forming waterspread of tanks, and 12·4 square miles comprising land thrown out of cultivation below the Byata, Kakol and five other minor tanks will yield a run-off much greater than that from the catchment area of the Bangalore Water-supply Reservoir; and considering that the remainder of the catchment area, consisting of dry cultivation, will be very impervious when the tank-filling rains fall in September, it may be accepted that the catchment area in question is similar to that of the Bangalore Water-supply Reservoir.

43. *Rain-fall.*—A statement comparing the rain-fall at Nelamangala, Dodballapur and Yelahanka, in the vicinity of the catchment of the Hessarghatta series, with that on the water-supply catchment area during the past three years is appended, but with reference to the same, I would here mention that the records of the three stations are incomplete and I consider untrustworthy.

Statement of rain-fall during 1890, 1891 *and* 1892 *on catchment area of Hessarghatta Tank and at Bangalore Water-supply Reservoir.*

Year.	Month.	Rain-fall in inches and cents.				Remarks.
		Sankey's Reservoir.	Nelamangala.	Dodballapur.	Yelahanka.	
1890.	January	Nil	Nil	Nil	Nil	
	February	Nil	Nil	Nil	Nil	
	March	·76	Nil	Nil	Nil	
	April	3·57	2·21	...	2·53	
	May	4·67	3·38	×	×	
	June	1·15	×	·10	×	
	July	4·02	2·22	1·92	1·94	
	August	6·95	6·16	...	3·33	
	September	3·70	3·37	1·92	4·02	
	October	3·81	...	4·98	8·65	
	November	5·66	2·39	7·42	6·38	
	December	Nil	Nil	Nil	Nil	
	Total.....	34 29	19·73	16 34	26·85	
1891.	January	Nil	Nil	Nil	Nil	
	February	Nil	Nil	Nil	Nil	
	March	·69	Nil	Nil	Nil	
	April	·28	Nil	Nil	·70	
	May	Nil	Nil	Nil	Nil	
	June	6·94	5·96	1 67	4·76	
	July	2·45	...	×	·85	
	August	2·30	×	3 34	1·41	
	September	·68	..	·51	×	
	October	5·94	×	4·20	4·30	
	November	·24	·46	·25	43	
	December	·26	·30	25	Nil	
	Total.....	19 78	6 72	10·22	12·45	
1892.	January	Nil	Nil	Nil	Nil	
	February	Nil	Nil	Nil	Nil	
	March	Nil	Nil	Nil	·18	
	April	1·39	·98	1·15	1·84	
	May	4 08	5·39	2·90	1·71	* Yield from catchment 25·898 m. c. ft.= 11,598 m. c. ft. per square mile.
	June	3·95	6·70	9·32	4·24	
	July	3·66	3·31	2·32	1·63	
	August	8·32	7·11	×	9·32	
	September	2·63	2 89	5·56	1·75	
	October	2·51	2·10	1 58	2·81	
	November	·29	·90	·83	Nil	
	December	...	...	..	...	
	Total.....	* 27·03	29·38	23·66	23·48	

In places marked × thus, the returns have not been received.

44. From my knowledge, which extends over several years, of the country forming the gathering ground of the whole of the series, I think I may safely state that the rain-fall at Hessarghatta is similar to that at Bangalore, while in the vicinity of Nundydroog it is greater—allowing this, also that the catchment area is similar to that of the Bangalore Water-supply Reservoir, it follows that the yield mentioned in para 39 may be taken as the basis for calculation of annual supply.

45. *Yield anticipated from Catchment.*—During ordinary years, the supply from the catchment area would be 334·4 m. c. ft., which would not half fill the impounding tanks, but this is immaterial, as the surplus alone from tanks above in addition to this quantity would supply 303·668 m. c. ft. more than the tanks will store.

46. The supply during a year of minimum rain-fall of 17″ would be 212·8 m. c. ft. and in the event of this occurring during the first year the supply of the station was started, the result would be that 245·655 plus 212·80 m. c. ft.=458·455 m. c. ft. would be stored for use during the following year, and level of water in the Hessarghatta Tank would be 60·00.

×*Vide* para 32.

Allowing a minimum rain-fall of 17″ during the second year, there would be 172·207 m. c. ft. stored for use at commencement of third year, as per details below:—

		M. C. Ft.
Quantity in reservoir at end of first year	...	458·455
Percolation 15 per cent of quantity stored	...	68·768
Annual consumption at 500,000 c. ft. per day	...	182·500
Evaporation allowing 6 ft. in depth per annum from mean area $\frac{1,259 + 639}{2}$	=	247·780
Total...		499·048
Balance Minus...		40·593
Add the yield for the year...		212·800
Balance available at end of second year...		172·209

47. The annexed Statement marked E shows the actual surplus from the Byata and Kakol Tanks and quantity lost by discharge over weir of Hessarghatta tank during the current year.

Statement E, showing surplus from Byata and Kakol Tanks and quantity lost by discharge over weir of Hessarghatta Tank durng current year.

Month.	Date.	Kakol Tank weir, 202 feet.			Byata Tank weirs, 225 feet.			Hessarghatta Tank weir, 290 feet.			Remarks
		Depth of Discharge.	Quantity in c. ft. per minute	Total for 24 hours.	Depth of Discharge.	Quantity in c. ft. per minute.	Total for 24 hours.	Depth of Discharge.	Quantity in c. ft. per minute.	Quantity in 24 hours.	
July ...	4th	1½′	1,997 04	2,875,737 6							The whole of the sub-series, with the exception of the Byata, drain into Kakol Tank.
	5th	4	8,734·4	12,577,536							
	6th	8′	24,698	35,565,120							The combined catchment area is 89,305 acres and capacity of the tanks inclusive of capacity of Kakol Tank 2,493 units=650·913 m. c. ft. and adding this to the quantity 935·489 m. c. ft. discharged over weir of Kakol Tank, the run-off from the whole catchment was 1,586·402 m. c. ft. equivalent to 11·3 m. c. ft. per square mile during 1892.
	7th	6′	16,046	23,109,686							
	8th	3′	56,773	81,753,984							
	9th	2′	3,088 8	44,479,296							
	10th	1′	1,091 8	1,572,192							
August ...	16th	6′	16,018 4	23,109,696	June 28th 1′—21′=63,000×60×24= 90,720,000.			8 days-2 feet spillage on weirs=605×60×24×290×8=2,021,184,000 c.ft.			Details of Hessarghatta Tank not kept.
	17th	1′	1,091·8	1,572,192	29th 1′—8″ =71,525× do 162,708,000.			7 days-1 ft. do 214×60×24×290×7= 625,577,400 do			
	18th	½″	386·5	556, 9234	30th 6′ =17,032× do 24,526,800.			1 day-½ ft. do 75×60×24×290 = 31,320,000 do			Taluk Amildar states there was a discharge of 2 feet over the weir for 8 days, 1 foot for 7 days and lastly half a foot.
	19th	½′	386 5	556,525 4	July 5th 4′ = 9,270× do 12,348,800.						
	20th	7″	20,220 5	29,117,606 4	9th 3′ = 6,030× do 8,683,200.						
	21st	7′	20,220·5	29,117,606·4	Total c. ft.....238,986,800.						* Not reliable.
	22nd	1″	1,091·8	1,572,192							
	23rd	½″	386·5	556,525·4							
								* 2,678,081,400			

	24th	¼″	386·5	556,525·4				
	25th	4½′	10,415 5	14,998,406·4				
	26th	4½	10,415 5	14,998,406·4				
	27th	3″	5,677 3	8,175,398 4				
	28th	1½	1,997 0	2,875,737 6				
September	25th	4½	10 415 5	14,998,406 4				
	26th	9	29,468	42,433,920				
	27th	11	39,834 8	57,362,112				
	28th	8½	27,051 2	38,954,728				
	29th	1½	1,997	2,875,737 6				
	30 h	36″	214,544	308,94°,300				
October ...	1st	18″	82,892	119,364,480				
	2nd	12′	45,389 2	65,360,448				
	3rd	6″	16,048 4	23,109,696				
	4th	7½	224,296	32,298,624				
	5th	1	1,091 8	1,572,192				
	6th	1	1,091 8	1,572,192				
	7th	½	386 5	556,525 4				
Total for year ...				93 >,489,>74 c ft		238,986,800 c ft		2,678,081,400 c. ft.

Note —Velocity of approach not known.

48. *Sanitary Condition of Catchment area.*—There are eight villages, particulars of which, with regard to population, &c., are given below situated in the vicinity of the margin of Hessarghatta Tank, and draining directly into it and in addition to these, there are the villages of Byata and Kakol draining directly into the tanks of the same name :—

West of Arkavati valley, villages draining directly into Hessarghatta Tank.

Sonnainhalli	115 houses and 415 inhabitants.			
Chikdevanpura	...		...	
Basvanpur	57	„	246	„
Ramsandrapallya	...		. .	
Kodinayakanhalli	...		...	
(Jodi village)	17	„	100	

East of Arkavati valley, villages draining directly into the tank.

Harohalli	42 houses		152 inhabitants	
Dasserhalli		„		
Gundapalli	82	„	234	„
Total...	313	„	1,147	„

Byata and Kakol villages consist of 150 and 107 houses and contain 522 and 331 inhabitants, so that the total population located in the vicinity of the Hessarghatta Tank is only 2,000, and I would submit that being so small, the removal of the villages is unnecessary; but better sanitary arrangements are requisite, especially in the villages of Byata, Kokal, Kodinayakanhalli and Gundahalli.

49. With regard to the necessity or otherwise of removal of villages, I would mention that in Fanning's—treatise on water-supply, it is stated as follows:—"About one-half the population of London, or one-half million persons received their domestic water-supply from the Thames in 1875."

Contours at R. L. 65·00 since taken show that Ramasandra Palya and Chikdevanpur on the west of the valley and Herohalli and Gundahalli on the east will be on the margin of the tank, and the e 4 villages must necessarily be removed.

"The drainage area above the pumping stations is about 3,675 square miles, and the minimum summer flow is estimated to be 350,000,000 imperial gallons daily and of this flow about 15,000,000 gallons is pumped daily by water companies. Upon the Thames water-shed above the pumping stations there resides a population of about 1,000,000 persons, including three cities of over 25,000 persons each, three cities of from 7,000 to 10,000 each, and many smaller towns and villages."

"The whole of the river and its principal tributaries are under the strictest sanitary regulations, which the Government is able to enforce, notwithstanding which a great mass of sewage is poured into the stream."

50. *Analysis of water*—Specimens of water taken from the tank and from the sluice of Hessarghatta, Byata and Kakol tanks have been forwarded to the Chemical Examiner of Mysore, but *analysis of same has not yet been received—the water in the Hessarghatta and Kakol Tanks appears to be good but that of Byata is rather discolored and probably contains vegetable impurities which must be due to the wet cultivation below the Amani Madhurai and Sheresandra Tanks having been extended into the bed of the Byata tank—this cultivation will I think cause much greater pollution of the water, than any that can arise from the small villages, and wet cultivation should I think be certainly prohibited within 100 yards of the margin of the whole of the tanks comprised the project.

*Annexed.

HESSARGHATTA TANK.

PHYSICAL EXAMINATION—*Taken from the Tank.*

Color		Slightly cloudy
Smell		None
Taste		None
Reaction		Neutral
Lime		Present
Chlorine		A trace
Sulphuric acid		None
Nitric		None
Ammonia		Trace
Sulphuratted Hydrogen		None
Hardness Total	..	19 grs. of carbonate of lime per gal.
Permanent ..	..	13·6 chloride of calca (mainly.)
Removable ...	..	5·4
Organic matter		...

Water taken from Sluice Cistern.

Almost precisely the same, only the amount of hardness both total and permanent is a trifle less, but nothing to speak of.

Opinion.—From the analysis I consider the water to be a good potable one; it might be a trifle less hard, but the total hardness is nothing like sufficient to render it unfit in any way for drinking purposes, it being just a trifle harder than the water in the Kukarhalli Reservoir at Mysore.

BYATA.

TWO SPECIMENS SENT.

A. Tank water.

Color	...	..	Faint cloud
Smell	...	...	None
Taste	...	...	None
Reaction	. .	...	Neutral
Lime	...	...	Present
Chlorine	...	...	A trace
Sulphuric acid	...	...	Nil
Nitric	...	..	Nil
Ammonia	...	...	Nil
Sulphuratted Hyd.		...	Nil
Magnesia	...	...	A trace
Total hardness	...	...	25·5 grs. of Ca Co2 per gal
Permanent	..	...	18·5 Ca C—Magnesia salts
Removable	...	...	7·0
Organic matter	..	...	represented as
Chlorine	...		

Water taken from the sluice.

Almost identical with the above—only it is a trifle less hard.

The water from the tank may be said to be a fair potable one and quite fit for use.

KAKOL TANK.

TWO SPECIMENS.

Water from the tank.

Color	White
Smell	Slightly earthy
Taste	None
Reaction	Neutral
Lime	Present
Chlorine	A trace
Sulphuric acid	Nil
Nitric	Nil
Ammonia	Nil
Sulphuratted Hyd. ...	Nil
Magnesia	Trace
Total hardness	15·40 grs. of Ca Coz per gal
Permanent	13·30 Ca C l Magnesia salts
Removable	2·10 Ca Coz
Organic matter	

The other sample is precisely the same. This water is by far the best of the 3 samples sent.

In the event of these tanks being used as a water scheme for Bangalore, it is presumed that they would all be conserved, in which case the water would be considerably better than it is at present.

(Intd) P. H B.

---

51. (A) *Brief description of project.*—It is proposed to impound 883·462 m. c. ft. of water in the eight tanks mentioned in para 28, and to deliver the same at the rate of 500,000 c. ft. per day into filter and service reservoirs located on the Mantapam Hill to the north of Bangalore.—(B) At Hessarghatta Tank a water tower will be constructed with valve at M. S. L. 2,796·84, from which water will be led by means of covered masonry channel 23,826 feet in length with a fall of 1 in 5,000 to settling reservoirs located close to a pumping station situated a short distance from the Bangalore-Tumkur branch of the Southern Mahratta Railway, half a mile north-west of the village of Banawar.—(C) From the pumping station the water will be raised to a stand post 42 feet in height constucted on the top of the Banawar Hill, the M. S. L. of which is 3,097·64.—(D) From the stand-post the water will be delivered in a cast iron Main, 24″ diameter by gravitation into filtering cisterns and service reservoirs, the combined capacity of which will be equal to five days' supply.—(E) The floor of service reservoirs to be at M. S. L. 3,055, which will give a sufficient head for an economical distribution to the Cantonment and City of Bangalore, the former of which being so widely scattered a maximum head is indispensable, unless the higher portions of Bangalore are provided with a separate service, which it is quite possible might prove to be the most economical.—(F) From the storage reservoirs service mains would be taken, one in a direct line to the Bangalore District Office for the City and the other to the Cantonment Railway Station, from which branches could be taken off for supply of northern and southern portions of Civil and Military Station.

52. Prior to entering into details of cost, &c., of the several items of work, I would here remark that the project is analogous to that referred to by Colonel H. M. Vibart, R. E., in paras 2 and 3 of his letter No. 2946, dated 20th October 1887, to the Chief Engineer, Madras Public Works Department (*vide* page 247 of Memorandum of Bangalore Water-supply) with reference to which, I would state that I have recently investigated a project (details of which are given below) for the construction of a dam across the Arkavati river, at a site situated 2½ miles below the bridge on the 12th mile of Salem-Bellary road, for irrigation of 2,000 acres of land on both banks of river, regarding which, it is only necessary here to mention that construction of a dam impounding more than 154·310 millons c. ft. of water is impracticable without endangering the safety of the Southern Mahratta Railway bridge across the same river.

Mean sea level of bed of river at proposed site of dam	...		2,718·56
Do of crest of dam	...		2,748·56
Quantity of water impounded	...		1,543·10 M. c. ft.
Cost of dam...	...	Rs.	40,451
Cost of raising road bridge 15 ft.	...	...	16,566
Probable amount of compensation for land submerged	...	...	8,940
Contingencies at 5 per cent	..	...	3,297
	Total	Rs.	69,254

STATEMENT OF PROBABLE COST OF PROJECT.

53. *Head works.*—Raising weir of Hessarghatta tank 15 ft. in height.

Constructive Details.

Weir on left flank at R. L. 2,819 17 and 300 feet in length.
Bund to R. L. 2,829·17 with top width of 15 ft. front slope 1½ to 1 and rear slope 2 to 1.
Revetment at R. L. 2,825·17.
Cill of sluice at R. L. 2,796·84
Area (approximate) of waterspread at 2,819·17=1,702 acres.
Capacity at R. L. 2,819·17=2,116½ units=767·337 m. c. ft

(*a*) *Bund.*—The right flank will be in continuation of the present cross bund, constructed during 1877. On the left flank, a cross bund will be taken off at bend in bund, at a distance of 330 yards from the present weir (See C. S. No. 5 on plan) and from thence will be continued to the High Ground, where it tails off at R. L. 2834·57.

							Rs.
Earthwork	167,154 C. Yds.	at	3 As.	per	yard	...	31,341
do	11,988	do	1½	do	do	...	1,124
Old stone revetment	2,190	do	10	do	do	...	1,369
New do	16,356	do	1¼ Rs	do	do	...	20,445
Old stone do	1,118	do	12 As.	do	do	...	899

(Stone to be taken from the abandoned portion of bund on right flank.)

Removal of right sluice and refilling bund	L. S.	300
Ring bunds at sluices while undergoing removal	L. S.	500
Repair of left sluice to allow of cultivation of garden land from water impounded between new and old weirs	L. S.	500

Puddle trench and wall,—

	As.	Rs.	
Excavation 14,988 C. Yds. at	1½	1,405	Rs. 9,591
Puddle wall 26,196 C. Yds. at	5	8,186	

Total for Bund Rs.....66,069

(*b*). *Waste Weir.*—It is propsed to repair and retain the present weir and to construct another weir above it, in the new bund on the left flank, as per plan—the crest will be at R. L. 2,819·17 and toe at R. L. 2,791·79—the weir will consist of a masonry body wall with wings, masonry binding walls 39½ feet apart in apron, and toe wall, the apron being sujikat of the best quality 1 yard in depth.

			Rs.	A.	P.		Rs
Brick in chunam ...	17,802 C. Ft.	at	0	3	0 per C. Ft.	...	3,338
Plastering with mortar ..	31·05 Sqrs.	at	3	0	0 per square	...	93
Sujikat	6,014 C. Yds.	at	1	8	0 per C. Yd.	...	3,021
Earthwork, cutting approach to weir... ...	*6,188 C. Yds.	at	0	1	0 per C. Yd.	..	386
Do do for apron, &c.	64,253 „	at	0	2	0 do	...	8,032
Do do draught channel from the weir ...	*1,46,300	at	0	1	0 do	...	9,144
Revetment to sides of apron and of draught channel above and below weir.	1,160 C. Yds.	at	1	4	0 do	...	1,450
Stone slabs 8″ at 8 annas per S. Ft.	4,159	...		...		...	2,079

Total for new weir Rs..... 33,513

* * to be used for bund.
* * Earth to be used for bund at rate of 4 annas per C. Yd., which will reduce the rate of earthwork for weir to one anna per C. Yd.

									Rs.
(c) *Repair of old weir*—				Rs.	A.	P.			
Brick in chunnam	...	3,444 C. Ft.	at	0	3	0	per C Ft.	...	646
Plastering with mortar	...	21 65 Sqr.	at	3	0	0	per Sqr.	...	65
Pointing with Portland cement		22 16 Sqr.	at	5	0	0	do	...	111
Old stone sujikat 46 C Yds.		...	at	0	10	0	per C. Yd.	...	29
Sujikat apron 350 do		...	at	1	8	0	per do	...	525
Stone slabs 8′ × 454 S. Ft.		..	at	0	8	0	per Sqr. Ft	...	227
Jelly packing to apron	...	1,245 Sqr Yds	at	0	1	6	per Sqr. Yd.	...	117
Petty jobs	...	... Lump sum					..	...	100
Blasting	...	...	do				...	...	150
Earthwork	...	...	do				...	...	50
									———
							Total for repair of work Rs.		2,020
									———

54. *Water Tower*:—

(A). It was first proposed to take off the delivery channel through the left flank of the new cross bund, at a short distance from the weir, and to follow the left bank of the river, but longitudinal section taken along this line shows that it is impracticable, as the ground is cut up into numerous ravines, across which it would be impossible to construct a water-tight channel except at a very heavy outlay, and moreover for upwards of half a mile, the channel would be below flood level of river (*see* Sheet No 12).

(B). In accordance with the Chief Engineer's instructions, given on his inspection of the tank, sections were taken along the right slope of the old abondoned bund of tank (*see* Sheet 13). A delilvery channel along this line is practicable, but would prove very costly, as two breaches (one of which is a very large one) in the old bund would have to be filled in, and an aqueduct 200 feet in length would be required where the channel necessarily crosses the river.

(C). The cost of filling in breaches would amount to Rs. 2,680 and that of aqueduct to Rs. 3,275, in addition to which a sum of Rs. 191 would have to be expended on excavation—the total outlay would thus amount to Rs. 6,146 which, although very heavy, would not be prohibitive, were it not that the aqueduct would be insecure—the flooring of the delivery channel being only ·35 feet above flood level in river, which would necessitate placing the under surface of girders at least ·77 feet below that level.

(D). The above mentioned lines being practically not feasible, another line was selected, which skirts the left end of proposed cross bund and then passes along the high ground at a short distance above the first line, quite clear of all ravines (*see* Sheet No. 14).

(E). The excavation will be from 14 to 24 feet in depth, but cost of same (Rs. 2,619) is much less than the cost of filling in the breaches and construction of aqueduct on the second line, and the alternative line, shown on Sheet No. 14, is, I think, the only practicable safe one.

(F). The alignment of the delivery channel being necessarily outside of the weir, the water tower must of course be in a similar situation, and site selected is the margin of the present water-spread, at a distance of 600 feet above the new weir, and well out of line of draught to it.

(G). The water tower will be similar to that constructed at the Bangalore Water-supply Reservoir (*vide* Sheet No. 17), the only exception being that valves will be placed at sluice openings, instead of wooden shutters.

(H). The tower will be octagonal 6 feet internal and 15 feet external diameter with vents at R. L. 2,796·84—2,804·28 and 2,811·72, and top at R. L. 2,823·17, or 4 feet above crest of weir.

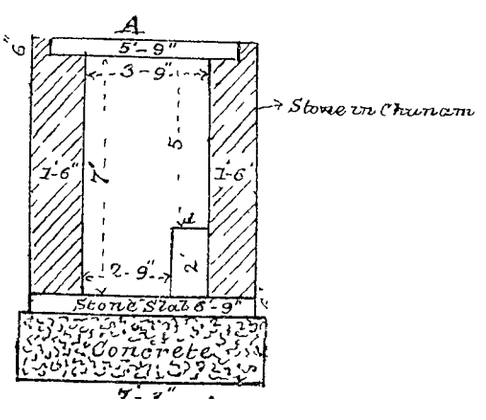
(1) A tunnel 676 feet in length will be constructed from the water tower, in which a 30′ cast iron flanged pipe laid at a slope of $\frac{1}{1000}$ will be fixed, and fitted with valves in water tower and at end.

55. The approximate cost of the work is as follows:—

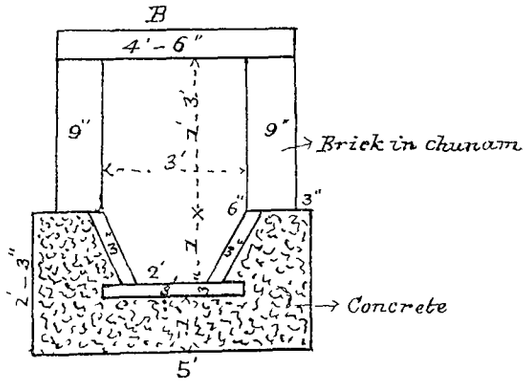
		C. Yds.		Rs.
(A)	"Earthwork"—			
	Excavation for open channel to water tower	622		
	Do for tower ...	1,648		
	For tunnel from tower ...	16,055		
	Total.....	18,325	at 2 as. 6 p. =	2,863
		C. ft.		
(B)	Concrete in Surki—			
	For foundation of tower $18\frac{1}{2} \times 18\frac{1}{2} \times 2'$ =	684		
	Do of tunnel $750 \times 13 \times 2'$ =	19,500		
	Superstructure of towers	5,660		
	Total.....	25,844	at 3 as. 3 p. =	5,250
(C)	Stone in Surki mortar—			
	For foundation of tower	919		
	Do of tunnel	19,500		
	Superstructure of tower	1,300		
	Total.....	21,719	at 3 as. 3 p. =	4,412
(D)	Cut stone work—			
	For tower... ...	788	at Re. 1 =	788
	Dressed Quoins... .. Sq. Ft.	1,276	at 4 as. =	319
(E)	Brick in Surki mortar—			
	Ventilating shaft	1,128		
	Side walls of tunnel	11,250		
	Total.....	12,378	at 3 as. 3 p =	2,514
(F)	Archwork in Surki mortar—			
	For tunnel	25,000	at 6 as. =	9,375
(G)	Stone Slabs 8′ dressed—			
	For floor of tower Sq. Ft.	1 7		
	Do of tunnel	6,375		
	Total.....	6,532	at 12 as. =	4,899
(H)	Cast iron flanged piping 30″ diameter and 1′ thickness of metal—			
	50 R. ft. weighing 2·68 cwt. per feet run 149 cwt. at Rs. 9—8—0 per cwt.		=	1,415
(I)	Carriage to site and fixing—			
	50 R. ft. at Rs. 1—8—0 per R. ft.		=	75
(J)	Valves 30′ double faced with gun metal (inclusive of carriage, &c.)—			
	No. 5 at Rs. 750 each		=	3,750
(K)	Open channel as per section in margin—			
	700 R ft. at Rs. 3 per R. ft.		=	2,100
	Total cost of water tower.....			37,760

56. Delivery Channel.

(A) To be of section A (given in margin) from end of tunnel of water tower up to the 54th chain, (vide sheet No. 14) where it falls off into low ground, with ventilating shafts and silt traps at every ten chains.



(B). From the 54th chain, the channel will be of section marked B with acqueduct at drainage crossings as mentioned in the subjoined report, and silt traps at every ten chains—the fall throughout will be $\frac{1}{5000}$ and both sections of channel will discharge more than the required quantity (5·787 cubic feet per second) when flowing 2 feet in depth.



(C). The channel as now aligned is very crooked, and, in addition to the alteration in the first 54 chains, several other deviations will be necessary, the principal being on chains 72 to 120, from chains 162 to 178 and from 270th to 305th.

(D). From 54th chain to 83rd chain the channel passes through dry cultivation, at 83rd chain it enters gardens, and continues in these up to 108th chain; the crossing of the kodi nala of Aivardanpur Tank is at the 99th chain where floor of channel is at R. L. 2,792·34 and bank of nala (which is frequently topped) at R. L. 2,796·89.

(E). This portion of channel (from 72nd to 120th chain) must be altered and longitudinal section of deviation is given in Sheet No. 15 from which it would be seen that the length of the channel can be decreased by 2,446 feet; the channel will be raised above the level of the ground for a distance of 688 running feet, and some arrangements will have to be made for irrigation of land lower down the valley, as the present earthen dam across kodi channel, by means of which irrigation is now carried on must be removed, the cost of such work will, however, be more than counter-balanced by saving in length of channel.

(F). From 120th chain the channel runs close to Aivardanpur irrigation channel up to 126th chain, from whence it turns to the left and runs through dry cultivation up to 162nd chain, where it enters the wet cultivation below the Huchuchakenhalli Tank; from 162nd to 178th chain the channel crosses this wet cultivation, and alteration of alignment will here be necessary, which will decrease the length of channel by 528 feet—the whole length of the channel (528 feet in length) of this re-alignment must be carried above ground level.

(G). From 175th chain to 241st chain the channel runs through—dry cultivation—from 241st to 250th through black cotton soil, where an alteration of alignment is necessary—from 250th to 289th the channel passes through dry cultivation, and from this point it follows the Railway up to 317th chain—from 270th to 305th chain the alignment should be altered and a further saving in length of over 6 chains can be made.

(H). At 305th chain the channel leaves the Railway and runs to the left, passing over very broken ground between 330th and 332nd chains and crossing the kodi nala of Kumbarhalli Tank at chain No. 335—the channel between 330th and 362nd chains should be carried higher up and kodi channel should be crossed 200 feet above present crossing. (An acqueduct 20 feet in length will be wanted across the Kumbarhalli drainage.)

(I). From 352nd to 376th chains the line of channel runs through the wet cultivation below the Kumbarhalli Tank and at 380th it crosses the combined kodi nala of the Banavar and Gamgarhalli Tanks. An acqueduct 50 feet in length is here necessary.

(J). At 385th a rather deep nala is crossed, but a little higher up, it tails off, and lower down forms an irrigation channel; consequently all that is necessary is to throw up a dam across it and construct a tunnel for irrigation on the left bank.

(K). From 386th chain the ground rises rapidly on all sides, and the channel cannot be continued beyond the 390th chain without necessitating deep cutting, which would add greatly to the cost of the settling reservoirs which are proposed to be placed at end of delivery channel.

57. Approximate cost of delivery channel :—

		C. Yds	Rs
(a)	Earthwork excavation and refilling—		
	For first 660 feet from end of Channel up to line with weir	17,954	
	Beyond line of weir up to commencement of chain No. 1—1056 feet	24,562	
	From 1st to 50th chain 3,300 R. ft ...	20,955	
	Total.....63,471		
	At As. 3—6 =		13,884
(b)	Delivery channel as per Section A—		
	From end of tunnel to 50th chain 5,016 R. ft at Rs. 10—6 =		52,041
(c)	Ventilating shafts and silt traps—		
	From end of tunnel to 50th chain No. 8 at Rs 175 ... =		1,400
(d)			
	Delivery channel as per sketch B. 18,810 feet at Rs. 4 ... =		75,240
	Fencing line and drainage 4·51 miles at Rs. 300 per mile ... =		1,353
	Compensation for lands, 12 acres at Rs 35 ... ... =		420
	Aqueduct—		
	No. 4 aggregating 1278 R feet inclusive of cost of channel at Rs 4 per R. feet ... ... =		5,112
	Silt traps—		
	One at every 10 chains, No. 34 at Rs. 10 ... ... =		340
	Total cost of delivery channel.....		1,49 790

58. *Settling tanks.*—At the end of delivery channel it is proposed to have two settling tanks, each to hold a day's supply The tanks will be 214 feet square at bottom and 10 feet in depth with slopes of 1 to 1, and will be floored and lined with 1½ feet of brick in surki plastered throughout with surki mortar

The site selected for the construction of tanks is a favorable one, there being four feet of "red soil" with clay underlying it.

The cost of the work will be as follows :—

		Rs
	Earthwork excavation 47,876 C yds at As 2 = ...	3 181
	Brick in surki 88,854 C. ft at Rs 3=	16 660
	Plastering with surki mortar 592 36 sq at Rs 3	1,777
D.	Pumping well, constructed with Portland cement L. S.	150
E.	*Land*	
	2 acres at Rs. 36	72
	Total Rs.	.22 11,
	For two tanks Rs.	14 286

59. *Pumps and Engines.*—(A) Will be fitted up immediately above the settling ponds at a distance of 150 yards from the Southern Mahratta Railway line.

(B.) Allowing 24" as maximum diameter of pipe main and that it is necessary, with reference to economy in cost of distribution, to have the floor of service reservoir at R. L. 3,055, the lift will be 357 ft. as per details below.

(C.) Level of service reservoir....R. L. 3,055·00.

Head necessary to discharge 500,000 C. ft. in a day of 13½ hours in 24" piping, the length of main being 36,960 ft.	74·00
Loss in filtering and service reservoirs	10 ft.
R. L. ...	3,139 ft
Floor of Settling Tanks R. L	2,782 ft.
Difference...	357 ft.
Pumping main 8,580 feet in length, 24" diameter, to discharge 617·3 C. ft. per minute head required	17 ft
* Total Lift...	374 ft.

(D.) The Agent of the Worthington Pumping Company, Calcutta, has been addressed regarding cost inclusive of delivery and erection of two triple expansion engines with Babcock boilers, each engine to lift 3,858 gallons per minute to a height of 374 ft. through 1¾ miles of 24" rising main; and on receipt of † reply, the actual cost of this sub-head of work will be given, but in meantime to allow of completion of approximate estimate, a sum of Rs. 2,00,000 has been allowed.

(E.) In order to reduce the lift as much as possible, pumping for 13½ hours per day has been allowed; but, as in any case relays of men would be necessary, this as well as the additional pumping of 7 hours twice per week, necessary to keep up the supply and allow of a day's rest on Sundays can be done without difficulty.

60. *Rising Main.*—

(A.) Will start from the 398th chain and be laid in a straight line to the top of the Banavara Hill, (517th chain) where it will be joined on to the stand post—at the 416th chain. The line of piping crosses a nala, 50 ft. in width and 8 ft. in depth, from whence up to the Railway (421st chain) it runs over broken ground—the line crosses the Railway diagonally at Telegraph post 200—191, where it is in cutting 4 ft. in depth, and a tunnel will be necessary—at the 442nd chain the line of piping crosses two ravines, and will have to be carried on masonry pillars for the distance of two chains—from this to top of hill there is not any obstruction of much consequence.

(B) The main will be of 24" socket and spigot piping and 8,580 ft. in length. The thickness of the piping being 1 inch, the weight inclusive of socket will be 2·37 Cwt. per ft. run.

85,80 × 2·37=20,334 Cwt. at 7—12—0	1,57,588

* Deduct 20 ft for suction.

† Telegram despatched and reply to following effect received —

"We can only quote for high pressure and compound, all triple expansion made under royalty by "S. Simpson & Co, London."

In reply to subsequent telegram asking for quotation for compound Engines, the Agent telegraphed—

"We have cabled for special quotation and will wire you on reply."

C. *Laying Pipes.*—

8,580 R. ft. of 24" piping at Rs. 1	8 580
Grand total of rising main...	166,168

61. *Engine and Boiler house with Chimney.*—

Lump sum	20,000

62. *Quarters for Establishment.*—

Lump sum	16,000

63. A. *Stand-Post.*—To be 42 ft. in height above top of Banawar Hill, the R. L. of which is 3,097·64.

B. Flanged pipes 24" diameter and $1\frac{1}{8}$" thickness of metal to be used. Special castings throughout will be necessary, as bends at base must have proper seating and flanges of piping must have lugs.

C. For 30 ft. in height the stand-post will be carried up in a masonry tower, which will serve as a watchman's post and signalling station; consequently struts and braces will be requisite for the upper 12 ft. only

64. *Details of cost*—

Tower 8 feet octagonal.

A.	Stone in chunam foundations	256 ft.
	Basement	57
	Superstructure	1,282
	Total	..1,595 C.ft.
	at As. 3—6	=Rs. 349
B.	Doors and Windows	Rs 50
C.	Roofing slabs and Terrace	Rs 30
D.	Ladder with trap doors	Rs 50
	Total	Rs 479

E. 24" flanged piping
F. 68 feet straight pipes with special flanges 30 ft of bends, &c
Total 98 ft. 2 75 Cwt. per ft.=269½ Cwt at Rs 10—8 Rs 2,830

Fixing piping 98 ft. at Rs 2	196
Grand Total, Rs	..3,505

65. *Delivery Main.*—A There is a nasty dip just beyond the brow of the hill, but this can to some extent be avoided by a slight detour to the west.

B. At 783rd chain the line crosses the Southern Mahratta Railway, and at 893rd chain, the Bangalore-Hindupur-Railway—from 864th to 881st chain, the line passes through the bed of the Yesvantapur Tank, but no deviation will, I think, be necessary on this account, as the soil in bed of tank is hard and clayey.

C. The total length of the main is 36,960 ft in which for 18,678 ft. or more than half the length, the head is less than 140 ft. but no alteration in thickness of metal in pipes has been made on this account, as 1′ is the least thickness that can be allowed for 24′ piping with regard to safety of carriage.

66. *Cost of Main.*—

36,960 R. ft. of 24" piping with 1" thickness of metal weight 2·37 Cwt. per ft. run—87,595 Cwt. at Rs 7-12-0 per Cwt.

	Rs.
	6,78,861
B. Laying pipes 36,960 R. ft. at 1 Rupee per ft. =	36,960
C. Air valves 5 at Rs 200	1,000
D. Scour valves 6 at Rs. 150	900
E. Sluice valves 4 with spigot and socket faced Tail Pipes at Rs. 520	2,080
F. Reflux valves 6 at Rs. 500	3,000
Grand Total for Delivery Main...	7,22,901

67. *Filtering Reservoirs.*—

A. Will be similar in construction to the settling tanks, *i. e.*, reservoirs sunk below ground level, floored and lined with $1\frac{1}{2}$ ft. of brick in chunam.

B. Three each 144 ft. square, two of which will filter a day's supply at the rate of 75 gallons per sq. ft. in 24 hours.—The filtering strata to consist of sand, charcoal and stone jelly 2'—6"—4" and 1 ft. in depth respectively.

68. *Cost of Reservoirs*—

A. Earthwork excavation—

	Rs
11,271 Cubic yards at 2 annas	1,409

B. Brick in surki mortar—

47 109 C. ft. at 3 annas .. .	8,833

C. Plastering with surki mortar—

399 7 Squares at Rs 3	1,197
Total.....	11,439
For 3 Reservoirs.....	34,317

69. *Service Reservoirs*—

A. Construction to be similar to that proposed for filtering reservoirs, with the exception that it will be covered with stone slabs carried on stone pillars 1 ft. sq., fixed 9 ft. apart from centre to centre, which will be founded on stone slabs, laid 1½ ft. below foundation of floor of reservoir

B. Reservoir to be 10 ft. in depth and to store 3 days' supply or 1,500,000 C. ft.

70. *Cost of Service Reservoirs*—

A. Earthwork Excavation—

	Rs
72,150 C. Yds at 2 annas	9,019

B. Brick in Surki—

277,200 C. ft at 3 annas	51 978

C. Plastering with surki mortar—

1882 80 Sqs at Rs 3 per Square	5,648

D. Stone slabs for foundation of pillars—

12 420 Sq. ft. at 3 annas	2,329
Carried forward.....	68,974

Brought forward... Rs. 68,974

E. Stone pillar 14′ × 1′ × 7″ (dressed)—

	Rs.
No. 2,070 at Rs. 5	10,350

F. Stone girders 9′ × 1′ 8″—

No. 2,000 at Rs. 3—8—0 ...	7,000

G. Stone slabs (9′ × 1½′ × 4½″) sides dressed—

186,979 Sq. ft. at 3 annas ...	35,059
Grand Total.....	1,21,383

71. *Distribution*—

Rupees 3½ per head for population of 250,000 ...	8,75,000

72. *Compensation.*—

A. Land thrown out of cultivation below Hessarghatta Tank—

	Rs.
Wet land 202½ acres at Rs. 75	15,187
Garden land 110½ do 100	11,050
Total.....	26,237
Deduct probable receipts by sale of land for dry cultivation, 313 acres at Rs. 36	11,268
Net compensation to be paid ...	14,969

B. Land thrown out of cultivation below Byata Tank—

Wet land 75½ acres at Rs. 75	5,662
Garden land 10½ do 100	1,050
Total.....	6,712

Land thrown out of cultivation below Kakol Tank—

Wet land 123¾ acres at Rs. 75	9,281
Garden land 11¼ do 100	1,125
Total.....	10,406

C. Land submerged by raising weir of Hessarghatta Tank—

Wet land—see statement of wet land below Byata and Kakol tanks—dry land *643 acres at Rs. 36 per acre	23,148

* In addition to this 158 acres of wet lands now lying fallow below the Byata and Kakol tanks will be submerged.

† Details for the five minor tanks cannot be given as Revenue statements for same have not yet been received from the Revenue authorities.

† Revenue statement for four tanks since received.

D. *Somanahalli.*—Land thrown out of cultivation—

	Rs.
Wet land 44 acres at Rs. 75	3,300
Garden land 2 do 100	200
Total.....	3,500

E. *Chik Devanpur*—

Wet land 28 acres at Rs. 75	2,100
Garden land 2 do 100	200
Total.....	2,300

Carried over... Rs. 61,035

Brought forward...Rs. 61,035

F. Devarakunte Tank—

	Rs.
Wet land 25 acres at Rs. 75	.. 1,875
Garden land 6½ do 100	... 650
Total.....	2,525

G. Arasinkunte—

Wet land 19½ acres at Rs. 75	... 1,462
Garden land 1½ do 100	.. 150
Total.....	1,612

H. Jumbinkunte—

Wet land at Rs. 75	
Garden do 100	
Grand Total.....	65,172

73. *Loss of Revenue*—

Particulars with regard to this item can only be given for the Hessarghatta, Byata and Kakol Tanks, as Revenue statements for the five minor tanks have not yet been received, notwithstanding several reminders have been sent to the Revenue authorities on the subject.*

Hessarghatta Tank—

	Rs.
Wet land	1,216
Garden land	628
Total.....	1,844

Byata Tank—

Wet land	493
Garden land...	78
Total.....	571

Kakol Tank—

Wet land	792
Garden land	51
Total.....	843
Grand Total. ...	...58
Deduct probable revenue from land below Hessarghatta Tank, if leased as dry land, 313 acres at Rs 2	
Net Loss.....	2,6 2

Sonnainhalli—

Wet land	220
Garden land	15
Total.....	235

Chik Devanpur—

Wet land	142
Garden land	19
Total.....	161

*Since received for other tanks.

Devarakunte—

		Rs.
Wet land	... ...	112
Garden land	... ...	12
	Total.....124	

Arasinkunte—

Wet land	... ...	82
Garden land	... ...	3
	Total...85	

Jumbinkkunte—

... ...		...
... ...		...
	Total.....	
Add loss of Revenue on 4 tanks noted above	...	605
Do 643 acres of dry land submerged		965
	Grand Total.....4,202	

74. *Abstract of Cost of Project.*—

Present value of 8 tanks comprising project (See Statement page 19)	1,04,795
Head works—	
Bund	66,069
Waste weir	33,543
Do	2,020
Water tower	37,760
	2,14,187
Delivery works—	
Masonry channel	1,49,790
Settling Tanks	41,286
Pumps and Engines	2,00,000
Rising Main	1,66,108
Engine and Boiler house with chimney ...	20,000
Quarters for establishment	16,000
Stand-post	3,505
Delivery Main	7,22,801
Filtering reservoirs	34,317
Service reservoirs	1,21,583
Town distribution	8,75,000
	23,53,250
Incidential charges—	
Compensation for land	60,172
Contingencies at 5 per cent	1,29,871
Establishment 15 per cent on Head works, masonry channel, settling tanks, engine and boiler house, quarters for establishment, Stand-post, filtering and service reservoirs	95,020
Establishment 5 per cent on other items ...	98,198
Grand Total.....Rs.	29,86,698

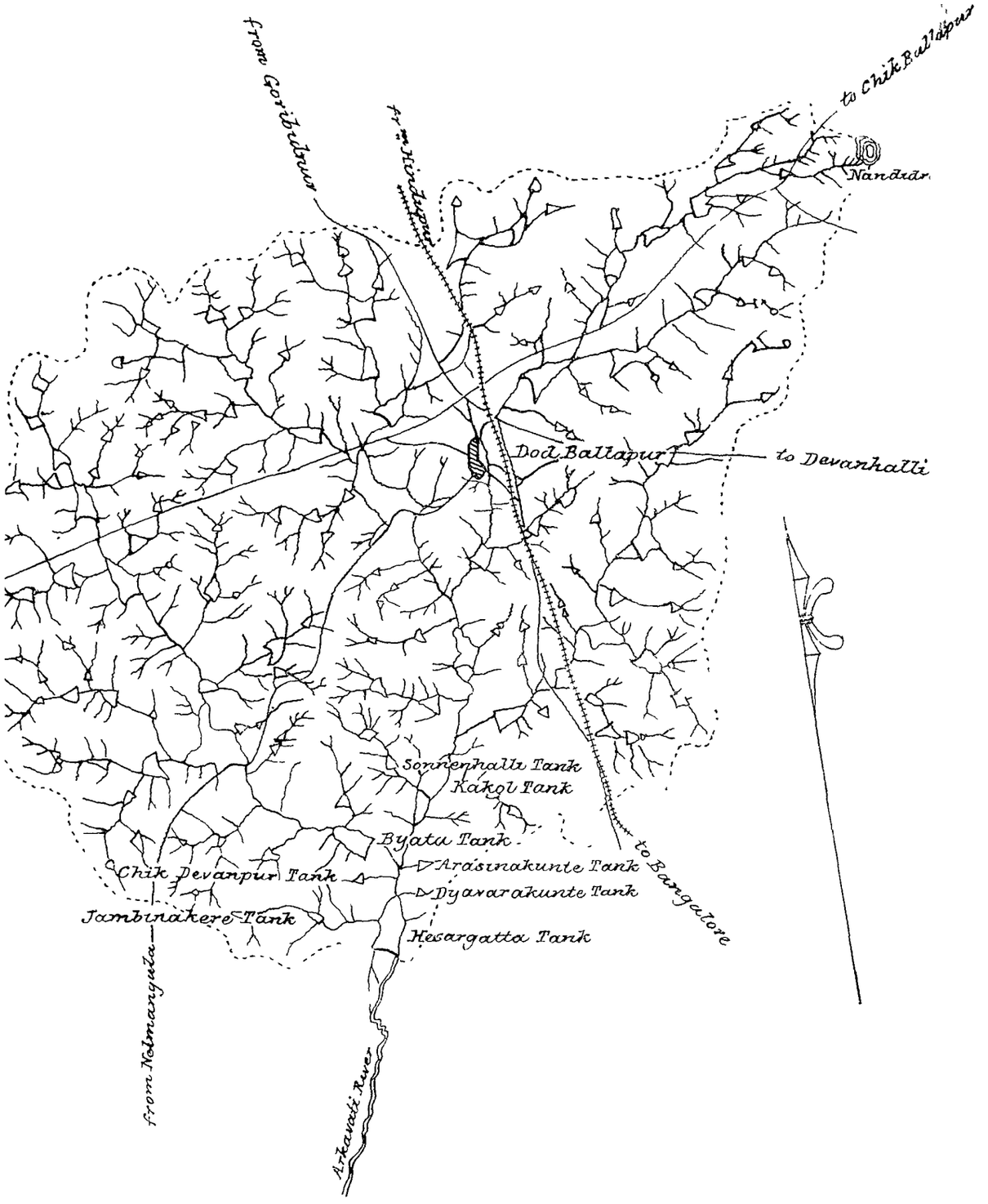
R. T. SCALDWELL,
Executive Engineer, Bangalore Division.

10th January 1893.

Mysore Govt, Central Press, Bangalore.—28-2-93.—100.

HESARGATTA TANK SERIES

Scale 1 Inch = 3 Miles



No of Tanks .. 197

Catchment area 212 Sq. Miles

D. P. W. — with Residency letter dated 5th December 1895.

The accompanying letter requires very careful consideration, as the arrangement to be concluded with the British Government as regards a supply from Heerangatta should be such as will avoid future complications of every kind.

Resignation of a claim to Sankey's — which Durbar have not recognized and which can never be recognized in reason — is no consideration, whatever.

The irrigation rate on which your letter of 25th March 1895 proposed to give the water at Headar ghatá would only apply if the ordinary rule for an irrigation supply as to Consinuance &c., is to be acted upon

The condition now asked — a reasonable one in itself — that the supply should be permanent and on <u>equal terms</u> with the Pillah makes it necessary to reconsider our original intention of using part

of the water stored for irrigation purposes.

With the demand of a Station supply as well upon the Reservoir, I think it most undesirable to use it both for water supply and irrigation purposes; and if we decide to prohibit irrigation altogether, we forego the contemplated irrigation of 4,193 acres and an anticipated revenue of Rs. 16,000. (See Col. McNeil Campbell's note dated 11th November 1893, and my note, 24th January 1894.)

I calculate the

cost of storage at Hessarghalla

as follows:—

i. Stock Value of Hessarghalla, Kakol, Bagatta and five other tanks. ——— 1,04,795

ii. Encargement of Hessarghalla — 3,24,779.

iii. Loss of wet & garden revenue under tanks comprised in the Scheme amounting to Rs. 6627 per annum and capitalized at 25 years purchase. — — — 1,65,675.

iv. Loss of revenue similarly calculated on 350 acres of dry land submerged or acquired for a marginal belt at Rs. 35/- per annum — — ——— 8,750.

Total — 6,03,999.

To this will have to be added the price of 211 acres wet and 110 acres garden land under the Hessarghalla tank, if we

have to buy them The original understanding with the ryots I think was to leave them undisturbed refusing them water and reducing the assessment proportionately But I would not object to buy the lands if the ryots would prefer to sell, rather than to hold without a supply of irrigation.

The British Government offer to relinquish Rs. 2, 33,000 they have paid for Maligai lands. These lands are very poor and only small prices can be —

realized by a re-sale. In this way we may expect to get about a lac or only $\frac{1}{6}^{th}$ of what the storage works have actually cost, but as I add vocate prohibition of all irrigation and as the British Government asks for what is equivalent practically to a half interest — for equal share on occasions of short supply means this — I consider one lac as not a ~~good enough~~ proper price. On the other hand I fear it would complicate matters if we ask for and get half the cost, for

that clearly would mean an equal interest. There are however important general considerations which incline me to accept the proposal of the British Govt.

The joint charges which the Resident agrees to share with the Durbar I believe are

Water tower	39,674
Masonry Delivery Channel	1,35,000.
	1,74,674
Probable cost of raising the sides	29,000
Total	2,03,674

One half of this leviable from the British Government is Rs. 1,01,837.

Now as the Station is to join us I want to adopt for the city the same financial arrangement and system of taxation as may be adopted for the

Station. This is a subject I would reserve for settlement after consultation with the Resident. Meanwhile, the subject should be carefully studied from all points of view in the Financial and Legislative Departments.

S/d K. Seshadri Iyer.

7 – December 1895.

To Councillors –
Matter for discussion at next meeting of Council or at an adj.d Early meeting

19/12/95

Seen
Passed on 19/12/95

Wednesday next 9 hrs
19

Madras Mail - 11 - 11 - 96

The Bangalore Water-supply.

(From our own Correspondent.)

BANGALORE, *7th Nov.*—The two important questions relating to the introduction of the tramways and lighting by electricity the Civil and Military Station of Bangalore, deferred from last month's ordinary monthly meeting of the Municipal Commissioners to this day's Special Meeting, having been adjourned to the next monthly meeting, the next most important subject discussed and disposed of was the letter from the 1st Assistant to the British Resident in Mysore, *in re* the temporary water-supply to the said station from the Chamrajendra reservoir, formerly known as the Hessarghatta tank. A few important modifications were made in the wording of the Draft Agreement, and the conclusion arrived at was that the said document between the Secretary of State for India and the Municipal Commissioners of the Civil and Military Station of Bangalore be accepted, provided that the cost does not exceed Rs. 62,000, as mentioned in the letter, dated 27th January, 1896, from the 1st Assistant Resident to the Municipality. The following is the Draft Agreement :—

"Memorandum of Agreement made this ——— day of ——— 1896, between the Secretary of State for India in Council (hereinafter referred to as the Secretary of State, which term shall include the Secretary of State party hereto, his successors in office and assigns, of the one part and. . . . the present Municipal Commissioners for the Civil and Military Station of Bangalore (hereinafter referred to as the said Commissioners, which term shall include the said Commissioners, parties hereto, their successors in office and assigns) of the other part.

Whereas, the Secretary of State has agreed to furnish a supply of water from the "Chamrajendra" Reservoir, formerly known as the Hessaraghatta Tank, for the use of the Municipality of Bangalore, upon the terms and subject to the conditions hereinafter expressed, now these presents witness, that it is hereby mutually agreed between the parties hereto, as follows :—

I.—The Secretary of State shall provide the funds required to meet the whole of the initial outlay on the works, including the cost of all machinery, pumps and pipes, necessary for bringing in a supply of water from the said "Chamrajendra" Reservoir to, and distributing the same within, the present limits of the Civil and Military Station of Bangalore (hereinafter referred to as the said station) and no charge for interest upon the capital so laid out shall be made against the said Commissioners. The making of house-connections is not included in the term "distributing," within the meaning of this Clause, nor is any future extension of the distribution to a new area included in the term "initial outlay."

II.—The execution, maintenance, management and control of the said works shall remain with and be entirely entrusted to the officers of the Government of India duly authorised in that behalf. The nature, amount, and extent of the works are within the sole discretion of the Government of India.

III.—In consideration of the payment by the said Commissioners to the Secretary of State of the sums provided under Clause IV hereof, the Secretary of State shall, from and after the completion of the said works, provide and continue to provide the said Commissioners with a supply of water equal to two-thirds of the whole quantity of water from time to time received in Bangalore from the said "Chamrajendra" Reservoir, subject nevertheless to the conditions hereinafter contained in Clause V.

IV.—In consideration of the water-supply to which they are entitled under Clauses III hereof, the said Commissioners shall pay annually to the Secretary of State two-thirds of the working expenses actually incurred in, and two-thirds of the estimated average annual cost of, maintaining the said works hereinbefore mentioned in Clause I. For the purpose of this agreement, the estimated average annual cost of such maintenance shall be calculated and made up as follows :—(*a*) One per cent. on the total initial outlay on all works, machinery, pipes, &c. (to meet the cost of repairs), (*b*) Five per cent. on the cost of machinery and pumps (to meet the cost of renewals) (*c*) Two per cent. on the cost of the rising main and distribution pipes (to meet the cost of renewals).

V.—If at any time the supply of water obtained from the said Reservoir shall be insufficient for all the purposes of the said station, the said Commissioners shall have no right to any supply of water from the said Reservoir under this Agreement, or otherwise, until the requirements of the troops located in the said station shall be fully satisfied, and the Secretary of State shall not be liable to pay to the said Commissioners any compensation or damages by reason of the failure of the water-supply as aforesaid. *Provided always* that in such case, the Secretary of State shall, during the continuance of such insufficient supply, allow such a reduction to be made in the contributions to be paid by the said Commissioners under Clause IV hereof, as to the Secretary of State shall seem reasonable and proper.

VI.—It is hereby agreed and declared that (notwithstanding anything to the contrary expressed and provided in the Code of Regulations relating to the appointment of Municipal Commissioners for the Municipal limits of the said Station and the management of its municipal affairs, published in the Notification of the Government of India in the Foreign Department, No. 319 I, dated the 9th day of February, 1883, hereinafter referred to as the said Code, or any other law for the time being in force) when the Resident in Mysore shall have notified to the said Commissioners that the said works for the supply of water to the said Station are complete, the said Commissioners may, subject to Clause II hereof, take such measures as to them may seem fit with regard to the assessment, levying and application of rates in respect of, and the protection, utilisation and distribution of, the said water-supply under the provisions of the said Code or any other law for the time being in force enabling them in that behalf, as though they had themselves carried out a system for the supply of water to the said Station. *Provided always* that in addition to the exemptions from assessment per rate in the case of buildings and land exclusively used for Military purposes, buildings ordinarily used as places of public worship and public Government and Municipal Offices, made by Section 65 of the said Code, or by any other law for the time being in force, all buildings and premises which are private property and which would, but for this proviso, be liable to assessment for rates under Section 198 of the said Code, but which are wholly occupied by persons who are in the employment of the Secretary of State in any of the Military Departments of the Government of India, shall not be liable during the period of such occupancy to any rate for the supply of water assessed by the said Commissioners under the provisions of the said Code or any such other law as aforesaid.

VII.—From and after the date upon which the Resident in Mysore shall notify as aforesaid, to the said Commissioners, that the said works for the supply of water to the said station are complete, the said Commissioners shall not (any provision in the said Code or other law for the time being in force relating thereto to the contrary notwithstanding) levy any license tax on professions, trades or callings in respect of any Military officer or soldier who is employed in Military duty in the said Station.

The following were the alterations made in the Memorandum of Agreement :—

For "new area" in Clause I, *read* 'area not at present included in the limits of the said station."

For "Bangalore" in Clause III, *read* "station."

After the words Secretary of State in Clause VI, add, "and on active duty in the said station."

Appendix B 16

Service letter
please see p 17

The Grounds of proposed Amendments

Clause 3 (a) "Restoration in Case of accident" Should be included, in order that there may be no room for any doubt in the matter.

3 (b) This new clause regarding the annual maintenance of the Reservoir Seems necessary.

3 (c) Any and not merely additional Establishments and protective and Sanitary measures" are apparently meant to be included and the insertion of "Any" before "Establishment" makes this ~~meaning~~ meaning clear.

The proposed proviso at the End of the clause Seems to be necessary to prevent the matter coming to be regarded as Subject of Arbitration under Clause 13.

Clause 5 .. "Deterioration" would include a falling off in quality or quantity - Decrease in quantity is meant to be provided for and "Deficiency" is proposed in lieu of "Deterioration". -

In the latter part of the clause "Combined" Seems more appropriate ~~accurate~~ than "Common" -

7. . . . The addition proposed at the End of this Clause is intended to prevent future doubt in the matter.

Clause 8. This clause as it now stands leaves the requirements of the future for mutual Settlement at the End of 7 years but provides for no periodical adjustment of Supply thereafter — In the case of a Permanent Water Supply it is most important that the principle on which it is proposed to provide for the future should be laid down in Express terms and not left ~~hereafter to it~~ to argument hereafter between British & Mysore officers, with the risk of a difference of opinion & Consequent recourse to Arbitration. Hence the Clause as proposed to be amended providing for the Supply for the Station and that for the City being Each taken at One million Gallons per Day during the next Seven years, and for a revision of the Supply to Each place being made at the End of 7 years and thereafter once in Every 10 years, accordingly to the increase or decrease of the Population of Each place and So as to maintain always, the first Seven Years ratio of Supply to population — This

Amended clause places the question of future supply upon an intelligible satisfactory basis, it safeguards the interests of both the Station & the City and it saves the Dunbar future unpleasantness of any kind in dealing with the Station Authorities.

Clauses 9, 10, 11 & 12. The proposed alterations in these Clauses follow from Clause 8 as amended —

25 Nov 1896. Kesharadeva Jha
Dewan

GOVERNMENT OF MYSORE

28. Nov 56

My dear Mr. Young

In case you want the amendments proposed by me in clauses 8, 9, 10, 11 & 12 of the Draft Agreement as to extension, I am quite willing to have contents with the slight alterations in clauses 8 & 9 which have

Inclosed is the indictment which may be of
interest to you in studying
the alterations, and the questions
have been addressed as applications to
an alternative in all this trouble
the accompanying copy
of the amendments as
proposed by me
yesterday. This copy

Yours truly
S. H. Kirkbride

(16)

APPENDIX B.

THE GROUNDS OF PROPOSED AMENDMENTS.

Clause 3—(*a*) " Restoration in case of accident " should be included, in order that there may be no room for any doubt in the matter.

3—(*b*) This new clause regarding the annual maintenance of the Reservoir seems necessary.

3—(*c*) *Any* and not merely *additional* " establishments and protective and sanitary measures " are apparently meant to be included, and the insertion of " any " before " establishment " makes this meaning clear.

The proposed proviso at the end of the clause seems to be necessary to prevent the matter coming to be regarded as subject of arbitration under Clause 13.

Clause 5.—" Deterioration" would include a falling off in quality or quantity. Decrease in quantity is meant to be provided for, and " Deficiency " is proposed in lieu of " Deterioration."

In the latter part of the Clause " Combined " seems more appropriate than " Common."

Clause 7.—The addition proposed at the end of this clause is intended to prevent future doubt in the matter.

Clause 8.—This clause as it now stands provides for mutual settlement of the supply at the end of seven years, but not for a periodical adjustment thereafter. In the case of a permanent water-supply, it is most important that the principle on which it is proposed to provide for the future should be laid down in express terms and not left to argument hereafter between British and Mysore Officers. Hence the clause as proposed to be amended providing for the supply for the Station and that for the City being *each* taken at one million gallons per day during the next seven years, and for a revision of the supply to each place being made at the end of seven years and thereafter once in every ten years, so as to maintain always an equal supply to the Station and the City, in accordance with the original intention.

Clause 9.—The proposed alteration is merely verbal and calls for no remark.

sd. K Sheshadri Iyer
Dewan

Submitted to the Diwan

pp C.S.

26.1.97.

Secy.

Send copy of this letter & agreement & my reply to D.S.W for information & record

pp K.S.

Do So

CS

4.2.97

Swift Mr Woods

Add copies bring file

pp K.S.

4.2.97

MEMO OF PAPERS CIRCULATED TO COUNCILLORS.

SUBJECT.

Residency letter
No. C.47 d/ the 22d January
1897 and this office letter
No. 41/D dated the 29th idem
to the Residency together
with a copy of the agreement
executed by the Dewan
~~for and on~~ behalf of the Maha-
-rajah of Mysore regard-
-ing the water supply of
the Hill Station of Banga-
-lore.

By order,

Secretary

10-2-1897

To—

Rajadharma Pravina
I. R. A. Thumboo Chetti, Esq., C.I.E. 10/2/97

P. N. Krishna Murti Esq. 11/2 per 13/2/97.

Khan Bahadur Abdul Rahman. 14-2-97

The Secretary

No. 4820, dated Bangalore, the 5th December 1895.

From—Captain K. D. Erskine, I S C, First Assistant to the Resident in Mysore, Bangalore.

To—The Dewan of Mysore.

With reference to the correspondence ending with my letter No. 4473 of the 8th ultimo, I am directed to address you on the subject of a water supply for the Civil and Military Station, Bangalore.

2. His Excellency the Viceroy during his recent stay at Bangalore took the opportunity of conferring with the Honourable Sir Henry Brackenbury, the Resident and yourself on the subject and it has now been finally decided to abandon the Maligal project and to adopt the Hessarghatta scheme, which promises an ample and assured supply of water, provided that the Darbar will agree to the Civil and Military Station being supplied from that source on terms which will enable the Government of India to carry out the project.

3. It is understood that the Darbar has already raised the old dam at Hessarghatta, and thereby formed a lake which on the 14th November actually contained 615 million cubic feet of water. Further, that the Darbar is erecting the necessary machinery for pumping and constructing reservoirs and laying pipes for the supply of the Bangalore City from this source. On the calculation of the present requirements of the Petta, these works will, it is understood, be capable of providing a surplus of 3,75,000 gallons of filtered water a day. The supply required for the whole Civil and Military Station is, however, calculated to be 10 gallons a day per head of population of 1,00,000 souls, or one million gallons a day.

4. The Government of India therefore asks the Darbar for permission to take a supply of water for the Civil and Military Station of Bangalore from or near the end of the duct leading from the Hessarghatta lake, by means of separate pumping machinery pipes and filters, to be constructed at its own expense. It is understood that the supply of water in the lake is estimated to be amply sufficient for the needs both of the Bangalore City and of the Civil and Military Station, but in view of a possible failure in the supply, temporary or otherwise, it is essential to the scheme that the British Government should be admitted to equal rights with the Darbar in regard to the distribution of the water of the lake. The scheme depends also on the willingness of the Darbar to give the water at a rate not exceeding the rate (Rs. 15 a million cubic feet) which they intend to charge cultivators if water is supplied for irrigation. These two matters which form a *sine quâ non* to the execution of the project were verbally discussed with you, and it is understood that you are prepared to accept both conditions as part of the arrangement. The formal assent of the Darbar to these conditions is now asked for as essential to the scheme.

5. The Government of India propose to pay to the Darbar half the cost of the Hessarghatta delivery channel and aqueducts, so far as these are utilized for the purposes of the water supply to the Civil and Military Station. The estimate for this including the half cost of raising the duct (to be mentioned hereafter) has been roughly estimated at Rs. 75,000. To this the Government of India propose to add Rs. 5,310 on account of half cost of the Darbar's workshops and plant for shops.

6. The cost of water at the rate above mentioned for the 60 million cubic feet estimated to be required for a year's consumption, would amount to Rs. 900 per annum or, capitalising at 4 per cent, Rs. 22,500. This amount the Government of India is prepared to pay to the Darbar. But in regard to this matter I am to make the following more comprehensive proposal. The British Government has paid to the State Rs. 2,33,000 on account of compensation for prohibition of cultivation, &c., in the Maligal valley. If the Maligal scheme is abandoned, it appears probable that the greater part of this compensation can be recovered by restoring the right of cultivating the lands; and the British Government would have felt justified in asking the Darbar to take measures

for such recovery as might be possible and crediting the amount to the British Government. But on the one hand this process would involve a rather troublesome adjustment, and on the other hand the Government of India is prepared to contribute towards the Darbar's expenditure in forming the Hessarghatta reservoir, as the Darbar is being asked to grant to the former equal rights in the water. What is proposed therefore is to assign to the Darbar all claim which the Government of India may have to the recovery of this sum of Rs. 2,33,000, in consideration of the above stipulation, and in payment of a contribution towards the cost of forming the Hessarghatta reservoir and of the capitalised value of water to be supplied, estimated on the present requirements of the Civil and Military Station at Rs. 22,500.

7. If effect is given to the above arrangements, the Government of India will be prepared, from the date on which the Hessarghatta water is brought in to the Civil and Military Station, to forego its claim upon the water of Sankey's Tank.

8. The following is a summary of the terms to which I am now to ask for the formal acceptance of the Darbar.

(1). Equal right's for the Darbar and the Civil and Military Station in the water of the Hessarghatta reservoir.

(2). Permission for the British Government to erect its own pumping machinery, to take off water from the Darbar's channel, and to lay its own pipes through the country intervening between that point and the Civil and Military Station.

(3). Payment to the Darbar by the British Government of Rs. 75,000 being half the cost of the Hessarghatta delivery channel and aqueducts, and Rs. 5,310, half the cost of the Darbar's work shops and plant for shops.

(4). Abandonment of all claim on behalf of the British Government for refund of the Rs. 2,33,000 paid to the Darbar for compensation in the Maligal valley, leaving the Darbar to retain any sums that may be undisbursed, and to recover what it can from the people to whom compensation has been paid.

(5). Abandonment of all claim by the British Government upon the water of Sankey's Tank from the time when the Hessarghatta water is brought into the Civil and Military Station of Bangalore.

9. With reference to the matter of raising the duct from the Hessarghatta reservoir mentioned in paragraph 5 of this letter, it is understood that the existing duct will not be equal to passing a combined supply of water for the Petta and the Civil and Military Station, and that it will be necessary to raise the sides of the duct by at least 18 inches. This would give an increased depth of water in the duct of 15 inches and leave 3 inches for construction of waste weirs at suitable intervals. As the duct has been constructed by the Darbar it would no doubt be best if the raising of the sides in the manner above indicated were carried out by the same agency and the estimated cost of the same has been included in the rough estimate mentioned in paragraph 5. If then the Darbar are prepared to accept the conditions above enumerated the Resident would be glad if this work could be taken in hand at once as it is understood that, when water has once been turned on to supply the Petta, the raising of the walls of the duct will be a matter of considerable difficulty.

10. I am to ask for the favour of a very early reply to this reference.

Residency Press, Bangalore.—5-12-95.

No. 4820, dated Bangalore, the 5th December 1895.

From—Captain K. D. Erskine, I. S. C., First Assistant to the Resident in Mysore, Bangalore.

To—The Dewan of Mysore.

With reference to the correspondence ending with my letter No. 4473 of the 8th ultimo, I am directed to address you on the subject of a water supply for the Civil and Military Station, Bangalore.

2. His Excellency the Viceroy during his recent stay at Bangalore took the opportunity of conferring with the Honourable Sir Henry Brackenbury, the Resident and yourself on the subject and it has now been finally decided to abandon the Maligal project and to adopt the Hessarghatta scheme, which promises an ample and assured supply of water, provided that the Darbar will agree to the Civil and Military Station being supplied from that source on terms which will enable the Government of India to carry out the project.

3. It is understood that the Darbar has already raised the old dam at Hessarghatta, and thereby formed a lake which on the 14th November actually contained 615 million cubic feet of water. Further, that the Darbar is erecting the necessary machinery for pumping and constructing reservoirs and laying pipes for the supply of the Bangalore City from this source. On the calculation of the present requirements of the Petta, these works will, it is understood, be capable of providing a surplus of 3,75,000 gallons of filtered water a day. The supply required for the whole Civil and Military Station is, however, calculated to be 10 gallons a day per head of population of 1,00,000 souls, or one million gallons a day.

4. The Government of India therefore asks the Darbar for permission to take a supply of water for the Civil and Military Station of Bangalore from or near the end of the duct leading from the Hessarghatta lake, by means of separate pumping machinery pipes and filters, to be constructed at its own expense. It is understood that the supply of water in the lake is estimated to be amply sufficient for the needs both of the Bangalore City and of the Civil and Military Station, but in view of a possible failure in the supply, temporary or otherwise, it is essential to the scheme that the British Government should be admitted to equal rights with the Darbar in regard to the distribution of the water of the lake. The scheme depends also on the willingness of the Darbar to give the water at a rate not exceeding the rate (Rs. 15 a million cubic feet) which they intend to charge cultivators if water is supplied for irrigation. These two matters which form a *sine quâ non* to the execution of the project were verbally discussed with you, and it is understood that you are prepared to accept both conditions as part of the arrangement. The formal assent of the Darbar to these conditions is now asked for as essential to the scheme.

5. The Government of India propose to pay to the Darbar half the cost of the Hessarghatta delivery channel and aqueducts, so far as these are utilized for the purposes of the water supply to the Civil and Military Station. The estimate for this including the half cost of raising the duct (to be mentioned hereafter) has been roughly estimated at Rs. 75,000. To this the Government of India propose to add Rs. 5,310 on account of half cost of the Darbar's workshops and plant for shops.

6. The cost of water at the rate above mentioned for the 60 million cubic feet estimated to be required for a year's consumption, would amount to Rs. 900 per annum or, capitalising at 4 per cent, Rs. 22,500. This amount the Government of India is prepared to pay to the Darbar. But in regard to this matter I am to make the following more comprehensive proposal. The British Government has paid to the State Rs. 2,33,000 on account of compensation for prohibition of cultivation, &c., in the Maligal valley. If the Maligal scheme is abandoned, it appears probable that the greater part of this compensation can be recovered by restoring the right of cultivating the lands; and the British Government would have felt justified in asking the Darbar to take measures

for such recovery as might be possible and crediting the amount to the British Government. But on the one hand this process would involve a rather troublesome adjustment, and on the other hand the Government of India is prepared to contribute towards the Darbar's expenditure in forming the Hessarghatta reservoir, as the Darbar is being asked to grant to the former equal rights in the water. What is proposed therefore is to assign to the Darbar all claim which the Government of India may have to the recovery of this sum of Rs. 2,33,000 in consideration of the above stipulation, and in payment of a contribution towards the cost of forming the Hessarghatta reservoir and of the capitalised value of water to be supplied, estimated on the present requirements of the Civil and Military Station at Rs. 22,500.

7. If effect is given to the above arrangements, the Government of India will be prepared, from the date on which the Hessarghatta water is brought in to the Civil and Military Station, to forego its claim upon the water of Sankey's Tank.

8. The following is a summary of the terms to which I am now to ask for the formal acceptance of the Darbar.

(1). Equal right's for the Darbar and the Civil and Military Station in the water of the Hessarghatta reservoir.

(2). Permission for the British Government to erect its own pumping machinery, to take off water from the Darbar's channel, and to lay its own pipes through the country intervening between that point and the Civil and Military Station.

(3). Payment to the Darbar by the British Government of Rs. 75,000 being half the cost of the Hessarghatta delivery channel and aqueducts, and Rs. 5,310, half the cost of the Darbar's work shops and plant for shops.

(4). Abandonment of all claim on behalf of the British Government for refund of the Rs. 2,33,000 paid to the Darbar for compensation in the Maligal valley, leaving the Darbar to retain any sums that may be undisbursed, and to recover what it can from the people to whom compensation has been paid.

(5). Abandonment of all claim by the British Government upon the water of Sankey's Tank from the time when the Hessarghatta water is brought into the Civil and Military Station of Bangalore.

9. With reference to the matter of raising the duct from the Hessarghatta reservoir mentioned in paragraph 5 of this letter, it is understood that the existing duct will not be equal to passing a combined supply of water for the Petta and the Civil and Military Station, and that it will be necessary to raise the sides of the duct by at least 18 inches. This would give an increased depth of water in the duct of 15 inches and leave 3 inches for construction of waste weirs at suitable intervals. As the duct has been constructed by the Darbar it would no doubt be best if the raising of the sides in the manner above indicated were carried out by the same agency and the estimated cost of the same has been included in the rough estimate mentioned in paragraph 5. If then the Darbar are prepared to accept the conditions above enumerated the Resident would be glad if this work could be taken in hand at once as it is understood that, when water has once been turned on to supply the Petta, the raising of the walls of the duct will be a matter of considerable difficulty.

10. I am to ask for the favour of a very early reply to this reference.

Residency Press, Bangalore.—5-12 95.

With Rob's letter 3rd Dec 95

D.P.W

The accompanying letter requires very careful consideration, as the arrangement to be concluded with the British Govt as regards a [redacted] supply from Hennaganna should be such as will avoid future complications of every kind.

Resignation of a claim to Sankey's — which Dunbar have not recognized & which can never be recognized in reason — is no consideration whatever.

The irrigation rate on which Govt letter of 25 March '95 proposed to give the water at Hennaganna W.S. any supply is the ordinary rate for an irrigation supply as to Contemnance &c. [redacted] is to be acted upon.

The Condition now asked — a reasonable one in itself — that the supply shall be permanent & on Equal terms with the Public makes it necessary to reconsider our original intention of using part of the water stored for irrigation purposes.

With the demand of a Station supply as well upon the Reservoir I think it very undesirable to use it both for water supply and irrigation purposes — and if

we decide to ~~[illegible]~~ prohibit irrigation altogether, we forego the contemplated irrigation of 4,193 acres and an anticipated Rev of Rs 16,000 -
(See Col Mc. W Campbell's note of 11 Nov 93 & my note 24 Jany 94)

On my return from Mysore with H Excellency's party the other day I got Mr Caldwell to give me the enclosed statement of Cost -

I Calculate the Cost of Storage at Hessarghatta as follows:—

i	Stock value of Hessarghatta Kakol, Byatta & 5 other tanks.	1,04,795
ii	Enlargement of Hessarghatta	3,~~74~~,779
iii	Loss of ~~assumed~~ wet & Garden Rev. under tanks comprised in the Scheme, amounting to Rs. 6,627 per annum & Capitalized at 25 years' purchase.	1,65,675
iv.	Loss of Revenue Similarly Calculated on 350 acres of Dry land submerged or acquired for a Marginal belt at Rs 350 per annum - - - - -	8,750
	Total.	(illegible)

To this will have to be added the price of 211 Acres wet & 110 acres ~~[illegible]~~ Garden Land under the Hessarghatta tank, if it

have to buy them. The original understand with the Ryots I think was to leave them undisturbed reducing them water & reducing the assessment proportionately. But I wd not object to buy the lands if the Ryots wd. prefer to sell, rather, a bold settlement & Supply of irrigation —

The British Govt. offer to relinquish Rs 2, 3 3, 000 they have paid for Malegne lands. ~~too may hope to realize about ½ lacs of this, which~~ ~~to be~~ 1/5 of what the Storage works have actually cost, ~~this wd. be fair~~ ~~Enough if we can realize more~~ Rs 8,000/ per Annum by means of ~~irrigation~~ but as I advocate prohibition of all irrigation & as the British Govt. asks for what is Equivalent practically to a half interest, — for Equal Share in occasions of Short Supply Means this —, I Consider 2 lacs is not a good enough price. On the other hand I fear it wd Complicate matters if we ask for & get half the Cost, for

I am Very ~~not to be~~ ~~item~~ only ~~I~~ can get a ~~.~~ In this ~~e~~ may ~~.~~ to get ~~a~~ lac ~~of~~

4

that Clause means an Equal interest

The joint charges which the Residents Agents share with the Durbar I believe are

Water tower	39,674
Masonry Delivery channel	1,35,000.
Probable Cost of Raising	174,67
The Side	29,000
Total.	203,674

One half of this leviable for the British Govt is Rs 1,01,8,37.

An Early opinion of the Chief Engr is Requested. I am going to Mr, tomorrow and if a personal discussion will facilitate disposal I will take him to Come to Mysore for a day.

Now the States is to join us I want to adopt for the City the Same financial arrangement & System of taxation as may be adopted for the State States.

This is a Subject I would reserve for Settlement after Consultation

with the Resident. Meanwhile the
Subject should be carefully studied from
all points of view in the financial &
Depts
7 Dec 95 Kitchener

Present value of eight tanks comprising Section

Hesperhatta tank	Rs 40,702
Kakol "	38,059
Byatta "	12,833
Tumbrikere "	4,248
Cheek Devampura "	2,349
Yamanakunte "	2,024
Shivanivuddy Attikunte "	2,624
Aswathakunte "	1,965
Total Rs	1,04,796

Statement of assessment of eight tanks on average supposed to be during past ~~ten~~ years 1894/95

110·79	Hesperhatta tank assessment	Rs 1,862	supposed to be 1,844
12·90	Kakol "	1,534	" 574
8·95	Byatta "	2,298	" 842
1·36	Tumbrikere "	~~360~~	supposed to be ~~360~~ 274
2·13	Cheek Devampura "	762	" 162
6·24	Yamanakunte "	124	" 124
1·36	Shivanivuddy Attikunte	266	" 236
1·29	Aswathakunte "	85	" 84
191·42	Total =	~~2,686~~ 6627	~~4,740~~ 4,131

Statement of cost of Improvement of tanks

Sum total as per Accounts	2,37,602
Compensation	77,625
Sum originally sanctioned	9,552
	3,24,779
Water Course	39,644
Original Channel	1,35,100
Total cost of Irrigation tanks Rs	211,110

Present available supply Hosepitta Tanks —— 1399 a
available from working of weir —— 374
Excess —— 1926

Say two lakhs as acquired above margin
of tanks —

Annual requirements of station Dorlaby 90,
Can intended to be irrigated below Hosser 4 as
4 000, acres — Anticipate increase in demand
Rs 16,000.

Water required to be used for irrigation 4000 acres
663 M. C. ft —

1 M. C. ft = 3·82 tanks —

Water-works, Hemavathi

(4)

MYSORE P. W. DEPT.

Serial No

TO THE DEWAN OF MYSORE

for ~~Sanction~~ consideration.

Since receipt of your memo. of 7th, yesterday morning, with Residency letter proposing conditions + terms for share in the Hemavathi water supply, I have been carefully studying the subject + I have jotted down notes in the several heads calling for certain remarks which I now send forward as a first instalment. I shall continue to keep the subject foremost in my mind, + will add later on any further remarks that may occur to me as worthy of discussion or comment.

Whatever 'consideration' Sankey's Tank water might have been ~~before~~, it is certainly more ~~must~~ that we do not want the water. That supposing the Whitefield farmers insist that their 'claim' was a complete + legal one all along, there should we not submit a bill for cost of maintenance during 10 + 15 years, that is a share in the distribution of water during 10 to 15 lakhs per annum to Dharmambudhi &c.

The 'irrigation' rate proposed to yield merely the revenue which Government would derive from wet assessment when dry land were converted into Wet by water let in the same trade. It takes no account of the increased value of the whole of the property which the supply would confer. It is the Capital Value which the Benefits.

Yes, irrigation will save it but let it be understood once for ever. In course of years it will be found that water is stored in the worst years just in excess of the requirements of Bangalore. The question of irrigating from it may be raised again.

In fact the contemplated irrigation would yield a revenue of Rs. 16000 to C & M. Station should pay their proportion of the cost, capitalised, but in is determined as in the future, if their payment would be refunded to them.

In assessing their share of this we must take account of what is the cost of the irrigation channels. This estimate has not been worked out. It would be of course towards a share of this charge against them.

The ryots holding gardens below the tank ought to be brought in. It has usually been complained that they are deliberately encroaching on the bund, and are sinking deep wells close by, which certainly endanger the tank & in a way drain it. This is a serious matter.

The whole question is a complex one, & many issues are involved. Do not set aside "equal rights", or "old terms", or "half interest", & simply ask us to guarantee to them — so far as a guarantee can be given in a case of water supply — a Million gallons a day at the end of our duct, at the irrigation rate agreed, but calculated on half irrigable land which their joining us precludes from irrigation? No capitalised Sankey Tank & Victoria off the

Bangalore Valley. & the highest abstraction apart from the Guarantee.

The direct cost from Shoolay to the Cantonment will be the saving of the duct, plus of Telephone wire, of railway sidings, & annual charges only than of Telephone charges & of railway sidings maintenance & establishment.

C. Chaves
Capt. R.E.

9 — 12 — 95.

I shall be very glad if you will let me have immediately a reply to my note of yesterday (which is printed) & if I may have more time to reply.

Note. (5) (1)

Resident's letter of 5th December, in re C. & M. Station water supply from Terraghatta.

Para 4 "Equal rights" are to be decided in regard to the distribution of water in the tanks.

This is a broad term & admits of considerable definition. Does it mean right to hold the water at one time in the tank, or to receive supplies as may arise in ordinary circumstances, or to have supplies, however, should the tank level fall, according to fluctuations of station & station?

It at once bars irrigation.

It may bar encroachment of tanks & the Estimate of area, quantum, &c. This is a point, but a result of the distribution to be made may be required.

Does it establish a claim to water on each tank above?

any right to interference with encroachments, removal of trees, cultivation, &c.?

(I note on correction with the Tahsildar that he claims all the water in the channel above the tank)

Rate on the water, i.e. the assessment

this was the basis intended for the distribution. Failing it, we could claim that the water was, if necessary, to be the basis of assessment on the lands, & such assessment would be divisible on basis of relative areas, irrigation, distance from the different tanks above, &c. &c. &c. This assessment is, I understand, to be levied annually. (10 rupees)

And in case of [illegible] the water [illegible] will continue [illegible]

way to [illegible] the proportion of Equal rights in

C. M. Station to draw 1,000,000 gallons a day, provided that if the total quantity which can be drawn on any day be less than 2,000,000 gallons, such quantity to be divided equally between the 2 places.

Note defining rights & liability when not taken into effect.

Duties & Rates likely to be the water for other purposes to be kept the margin which shall not be fixed

The Irrigation & Navigation Department paid. will C. & M. Station have its share.

H.M. Sanitation Department of [illegible] have any right the Troops

VI Mains delivery channel & tower

Mains of W Works temporary Light & Power to Bund Water

VII Are these going to pay this -

Para 4 ..

the delivery channel

In case of damage or leakage will not sharing of workshops & plant involve interference, claims, I think the C. & M. Station, Station might certainly have its shops.

In connection with this comes in question of share in railway fund its management, &c.

Para 6. Rs. 22,500 — payment for 60 million cft. a year in, subject on the face of it this allows seven exhaustions. I wonder if it was meant seriously — perhaps it is a "realm"

N.B. Is value of water ever of being capitalised? The value this water must surely increase every 7 years.)

I doubt whether anything like compensation basis for the municipal can ever be recovered. The average rate paid to compulsorily existing occupiers of village lands, must very different from the rate that is realised by making them back

Para 7. Claim on Sandley's Land

a claim has never been recognised thought the "claim" urged on behalf of the C & M. Station, not by that for the whose troops were to / for the water delivered therefrom. P to The water of Sandley's Land is all [illegible] just when we don't want it!

It occurs to me here, though

point is not directly connected with the water question, that Saulkey's catchment may now become extremely valuable for building sites. It is a splendid area for town extension. This will have to be kept in sight, if we want to avoid those unhappy Tanks & filter beds about innumerable Hill.

Para 4 — The raising of the dwelt has to be weighed, as regards capacity, strength of side walls, &c

---

Dewan's remarks of 7th Dec. on Residency letter. . . . —

Calculations. Enlargement of Hassanhatta Tank is first dealt with as Rs. 3,24,779. This does not take account, i' estimate, of the future annual charges for maintenance & establishment. A reliable estimate will have to be placed in charge of the Tanks, water. Taxes, sluices &c Tanks & register carefully the gauge readings recently ordered, for convenience, &c.

Besides this the cost of the Tramway which we are about to lay down the Pumping stations & the Tanks should be added

(Probably Sir Caldwell may have Tatkal accounts of these items, but I think not).

In connection with this the annual & additional cost for the Engineering staff will have to be added. This is an essential addition to the project, & the need for it, more & better, as well as these charges should be kept before the Government. [illegible]

cost of Establishment of this from the beginning, surveys, &c. — in Mr Caldwell's Tatkal !

The Tank channel & the Cart, to be [illegible]

Mr Caldwell for

Telephone, fuel hiring, & inspection Tramway -

Maintenance (Ordinary) of Tank — 1/2%
Pressure at Tank — 15%
Tank — 1/2% 20

Cost of Water

Delivery channels, + Channels is sent down at Rs. 2,03, which Rs. 1,01,837 includes Contingencies.

To this again must be added maintenance. This item must be capitalized, but C. + M. St. agree to pay annually their share thereof.

In his Estimate of the charges for same Mr. Caldwell has included cost of the land, fencing, &c.

One important item is the use of the Railway sidings on the C. + M. Station which Tata advantage to our fuel [illegible] for the supply of their [illegible] Engines, &c, which I presume the Railway Co. cannot accede unless for some of our Railway works, as here their Pumping Station will be near neighbourhood of ours

Ebbs

9.

Urgent (6)

MYSORE P. W. DEPT.

TO THE DEWAN OF MYSORE

for Sanction orders.

Hesaraghatta Tank catchment

I have just received this report from Mr. Hutchins who returned from Hesaraghatta this morning.

His description of the condition of the villages adjoining the tank, & more especially the state of the bunds along margin of the water which was brought up calls for urgent orders.

Apparently nothing is being done to get the people away from the villages that are to be inundated & for which I believe compensation has been paid. Immediate action seems necessary, and the grazing of cattle along the water margin should be stopped at once. The aid of the Police might well be called in — if only 6 Police in the villages.

If the Doctors of the C. R.

In Stetson and
the state of the art
just above the water. Still
as now described, the re
regarding the joints
will certainly be clear
an element of conflict w
controversy will arise a
very intent.

C. Chevier

11 — 12 — 95

To Secy. Office Note 7

I Yesterday inspected the Hesaraghatta Tank, and then walked along the margin of the Tank's waterspread from Hesaraghatta to Kakol Tank and back. I would particularly bring to your notice that the Villages of Goudihalli, Chik Gondahalli, Karohalli, Medihalli, Basavanapura, Chik Devasipura, ?, and Basavihalli, all situated close to the edge of the waterspread, and which were ordered to be removed to new Sites, some two years ago, are still just as they were, and, as far as I was able to learn, the Villagers had no intention of moving. These 8 villages & Pyatahalli are a source of great pollution to the waterspread in that

(1) the manure pits & cesspools in the vicinity of each is used as the latrine.

(2) the manure pits & cesspools in each village are simply sunks of rotted matter as usual.

(3) The waste land between the actual water margin and the cultivation, which has been kept up for the sanitation of the Tank, is used by the whole of the cattle of these 8 or 9 Villages & I shall be glad to have land for their cattle, as the whole of the waste is covered by the villages from the water

frontier away; to allow big abro
So convenient.
This margin of waste land all
round the tank is covered with
cattle droppings as ~~at Kasauli~~
in a cattle yard:
It is my opinion that these
villages must at once be
removed & the houses &
refuse burnt. There will then
be a regular conservancy
establishment at first, & the
villagers will always bring their
cattle down to the tank.

J. Ellis

11-12-95

Final 8

Draft

No 48/D.

OFFICE OF THE DEWAN OF MYSORE,
Dated, Bangalore, 13th January 1896.

Desp 16

FROM

THE DEWAN OF MYSORE.

To

THE RESIDENT IN MYSORE.

SIR,

I have the honor to acknowledge the receipt of your office letter No. 1820, dated 5th December 1895, regarding a supply of water from the Hessarghatta Tank for the Civil and Military Station, Bangalore, and in reply to convey to you the views of the Durbar as follows.

2. In para 1 of the letter under reply reference is made to a rate of Rs. 15 per million cubic feet, which the Durbar would have ordinarily charged if the water were supplied for irrigation. In fixing the irrigable area under a tank, however, account is taken of the entire quantity of water storable in it, and the wet assessment charged on such area is levied every year without reference to any deficiency or failure of the supply in particular years. A town supply, on the other hand, has to provide a fixed certain quantity every day throughout bad and good years. Moreover, in a town supply nearly 15 per cent of the storage is lost in percolation, and (with our water spread at Hessarghatta) 45 per cent is lost in evaporation leaving available only 40 per cent of the quantity stored. Thus a cubic foot of water given for the permanent water supply of a town is equivalent in value to 2½ cubic feet stored for irrigation, and this value will be very largely enhanced if the reserve required for a town supply is to be three times the annual consumption.

3. The storage works at Hessarghatta have cost the Durbar as follows:—

		Rs.
i	Enlargement of Hessarghatta	321770
ii	Loss of Wet and Garden Revenue under tanks comprised in the scheme amounting to Rs. 6627 per annum and capitalized at 25 years purchase	165675
iii	Loss of revenue similarly calculated on 360 acres of *dry land* submerged capitalized at annual holding at Rs. 30 per annum ..	8700
	Total ..	199204

To this will have to be added the price of 211 acres wet and 110 acres of garden land under the Hessarghatta Tank, if as is probable the Durbar have to buy them Say Rs. 5,25,000

I do not think the Resident would approve

approved

Kempanarayanamma

1.96

4. The capacity of the Hessarghatta and the minor tanks comprised in the scheme is 730 million cubic feet. The maximum annual quantity required for the City had been estimated at 87·6 millions of cubic feet at 2 cubic feet per day per head of a prospective City population of 120,000, and, after providing for such a supply, the Durbar expected to be able to spare water for the irrigation of a large area of land. With the addition of the Station supply this expectation is no longer capable of ready realization, but nevertheless it is desirable in recognition of the Durbar's proprietorship, to have a definite arrangement for the regulation of any feasible irrigation under the tank.

5. With these preliminary observations I have much pleasure in conveying to you the acceptance by the Mysore Government of the main proposals specified in the letter under reply, subject to the following remarks regarding the detailed conditions summarised in para 8 of that letter.

6. The 1st condition is in the following terms—

"(1) Equal rights for the Durbar and the Civil and Military Station in the water of the Hessarghatta Reservoir."

The above does not, I am given to understand, exactly represent what is required. As the intention is to ensure that the supply to the City and Station should be equal, in the case of the Station supply falling below the stipulated quantity, the Durbar would word this condition thus:—

"(1) The Civil and Military Station to draw from the delivery channel, by metre, the stipulated quantity of one million gallons a day; provided that if, owing to short supply in the tank, only less than two million gallons per day can safely be drawn on any particular day for the supply of the Station and City, the quantity actually drawn on such day to be divided equally between the Station and the City."

7. I would add also further conditions as follows:—

"(2) The Durbar to be at full liberty to use the water in the tank for purposes other than the supply of the Station and the City, to the extent of the water available in the tank, and the water level, below which the Durbar must not draw from the tank for such other purposes, to be fixed by mutual agreement. The other purposes mentioned in this clause shall be deemed to include irrigation.

"(3) Any removal of villages, prevention of cultivation, and other measures of sanitation (in addition to those already carried out by the Durbar) which the British Government may hereafter desire, to be paid for by the British Government."

8. The 2nd condition of your para 8 is accepted and may be numbered the 4th.

9. The 3rd condition may be altered so as to include the water tower, the raising of the duct, and the maintenance and repairs to the whole of the delivery works, and may stand thus:—

"(5) The works for delivery of the water from the tank to the pumping stations (water tower, aqueducts, and channel) and their future improvement, repair and up-keep, as well as the workshop and its plant, and additions, improvements and repairs to the same, and the salary of the workshop staff, to be paid for by the City and the Civil and Military Station in equal shares, but to be under the management and control of the Durbar."

The approximate cost of these works, according to the latest estimate to hand, is as follows:—

		Rs.	Rs.
1	Water tower		39 674
2.	Masonry delivery channel and aqueducts, total cost ...	1,37,000	
	Deduct cost of portion (between No. VI aqueduct and the Durbar's pumping station) not proposed to be used by the Civil and Military Station ...	24,000	
			1,13 000
3	Probable cost of raising the sides of the channel for the purpose of the Station supply		31,000
	Total Delivery Works .		1,83 674
4	Workshop		5,000
5	Workshop plant		10 620
	Grand Total ..		1,99,294

Half cost of the above payable by the British Government amounts to Rs 99,647, but the exact amount can only be ascertained hereafter.

10. The Durbar accept condition 4 of your para 8 (new No. 6). They expect to realize a portion of Rs. 2,33,000 paid by the British Government for the acquisition of the Maligal catchment, and the amount recovered would go to reduce their expenditure on the drainage works.

11. Condition 5 of your para 8 (new No. 7) relates to Sankey's Tank. This tank has been built and maintained from the revenues of the Mysore State and it has cost up to date nearly 6 (six) lakhs of rupees. It is useful for the water-supply of either the City or the Station

at the Durbar note with satisfaction the proposed abandonment of the claim of the British Government as it is desired to find some other use for it hereafter

12. The Durbar would add the following conditions :—

"(8) Hessarghatta and the minor tanks included in the scheme and the catchment area of the same to be under the exclusive management and control of the Durbar.

"(9) For the ordinary maintenance and conservancy of these tanks, the Durbar to maintain a suitable establishment (costing say, Rs. 500 a month) and the cost of this establishment to be shared equally between the City and the Civil and Military Station.

"(10) The restoration of these tanks, should there happen any accident to them, and the contribution of the British Government towards the cost of such restoration, to be reserved for mutual agreement at the time when the occasion arises.

"(11) The Durbar not to be liable for any diminution in, or interruption of, the required supply of water, arising from accident, failure of rains, or any other cause.

"(12) The cost of the telephone from Hessarghatta to Bangalore, and any other subsidiary works for the common use of the City and the Civil and Military Station, to be borne by both in equal shares"

13. The Durbar propose to call the Hessarghatta Tank and works after the name of His Highness the late Maharaja Chamarajendra Wodayar Bahadur.

14. I beg to append to this letter a memo of the conditions drawn up in accordance with the preceding paragraphs.

I have the honor to be,

Sir

Your most obedient servant,

Dewan of Mysore.

8

No. 48
D.

OFFICE OF THE DEWAN OF MYSORE,
Dated, Bangalore, 13th January 1896.

FROM

THE DEWAN OF MYSORE.

To

THE RESIDENT IN MYSORE.

SIR,

I have the honor to acknowledge the receipt of your office letter No. 4820, dated 5th December 1895, regarding a supply of water from the Hessarghatta Tank for the Civil and Military Station, Bangalore, and in reply to convey to you the views of the Durbar as follows.

2. In para 4 of the letter under reply reference is made to a rate of Rs. 15 per million cubic feet, which the Durbar would have ordinarily charged if the water were supplied for irrigation. In fixing the irrigable area under a tank, however, account is taken of the entire quantity of water storable in it, and the wet assessment charged on such area is levied every year without reference to any deficiency or failure of the supply in particular years: a town supply, on the other hand, has to provide a fixed certain quantity every day throughout bad and good years. Moreover, in a town supply nearly 15 per cent of the storage is lost in percolation, and (with our waterspread at Hessarghatta) 45 per cent is lost in evaporation, leaving available only 40 per cent of the quantity stored. Thus a cubic foot of water given for the permanent water-supply of a town is equivalent in value to $2\frac{1}{2}$ cubic feet stored for irrigation, and this value will be very largely enhanced if the reserve required for a town supply is to be three times the annual consumption.

3. The storage works at Hessarghatta have cost the Durbar as follows:—

		Rs.
i.	Enlargement of Hessarghatta	3,24,779
ii.	Loss of Wet and Garden Revenue under tanks comprised in the scheme, amounting to Rs. 6,627 per annum, and capitalized at 25 years' purchase	1,65,675
iii	Loss of revenue similarly calculated on 350 acres of *dry land* submerged or acquired for a marginal belt at Rs. 350 per annum ...	8,750
	Total .	4,99,204

To this will have to be added the price of 211 acres wet and 110 acres of garden land under the Hessarghatta Tank, if, as is probable, the Durbar have to buy them Say total Rs. 5,25,000.

4. The capacity of the Hessarghatta and the minor tanks comprised in the scheme is 730 million cubic feet. The maximum annual quantity required for the City had been estimated at 87·6 millions of cubic feet at 2 cubic feet per day per head of a prospective City population of 120,000, and, after providing for such a supply, the Durbar expected to be able to spare water for the irrigation of a large area of land. With the addition of the Station supply this expectation is no longer capable of ready realization, but nevertheless it is desirable, in recognition of the Durbar's proprietorship, to have a definite arrangement for the regulation of any feasible irrigation under the tank.

5. With these preliminary observations I have much pleasure in conveying to you the acceptance by the Mysore Government of the main proposals specified in the letter under reply, subject to the following remarks regarding the detailed conditions summarised in para 8 of that letter.

6. The 1st condition is in the following terms—

"(1) Equal rights for the Durbar and the Civil and Military Station in the water of the Hessarghatta Reservoir."

The above does not, I am given to understand, exactly represent what is required. As the intention is to ensure that the supply to the City and Station should be equal, in the case of the Station supply falling below the stipulated quantity, the Durbar would word this condition thus :—

"(1) The Civil and Military Station to draw from the delivery channel, by metre, the stipulated quantity of one million gallons a day ; provided that if, owing to short supply in the tank, only less than two million gallons per day can safely be drawn on any particular day for the supply of the Station and the City, the quantity actually drawn on such day to be divided equally between the Station and the City."

7. I would add also further conditions as follows :—

"(2) The Durbar to be at full liberty to use the water in the tank for purposes other than the supply of the Station and the City, to the extent of the water available in the tank, and the water level, below which the Durbar must not draw from the tank for such other purposes, to be fixed by mutual agreement. The other purposes mentioned in this clause shall be deemed to include irrigation.

"(3) Any removal of villages, prevention of cultivation, and other measures of sanitation (in addition to those already carried out by the Durbar) which the British Government may hereafter desire, to be paid for by the British Government."

8. The 2nd condition of your para 8 is accepted and may be numbered the 4th.

9. The 3rd condition may be altered so as to include the water tower, the raising of the duct, and the maintenance and repairs to the whole of the delivery works, and may stand thus:—

"(5) The works for delivery of the water from the tank to the pumping stations (water tower, aqueducts, and channel) and heir future improvement, repair and up-keep, as well as the workshop and its plant, and additions, improvements and repairs to the same, and the salary of the workshop staff, to be paid for by the City and the Civil and Military Station in equal shares, but to be under the management and control of the Durbar."

The approximate cost of these works, according to the latest estimate to hand, is as follows:—

		Rs.
1. Water tower		39,674
2. Masonry delivery channel and aqueducts, total cost ...	Rs. 1,37,000	
Deduct cost of portion (between No. VI aqueduct and the Durbar's pumping station) not proposed to be used by the Civil and Military Station ...	24,000	
		1,13,000
3 Probable cost of raising the sides of the channel for the purpose of the Station supply ...		31,000
Total Delivery Works...		1,83,674
4. Workshop		5,000
5 Workshop plant		10,620
Grand Total ...		1,99,294

Half cost of the above payable by the British Government amounts to Rs. 99,647, but the exact amount can only be ascertained hereafter.

10. The Durbar accept condition 4 of your para 8 (new No. 6). They expect to realize a portion of Rs. 2,33,000 paid by the British Government for the acquisition of the Malgal catchment, and the amount recovered would go to reduce their expenditure on the storage works.

11. Condition 5 of your para 8 (new No. 7) relates to Sankey's Tank. This tank has been built and maintained from the revenues of the Mysore State, and it has cost up to date nearly 6 (six) lakhs of rupees. It is no longer useful for the water-supply of either the City or the Station,

but the Durbar note with satisfaction the proposed abandonment of the claim of the British Government as it is desired to find some other use for it hereafter.

12. The Durbar would add the following conditions :—

"(8) Hessarghatta and the minor tanks included in the scheme and the catchment area of the same to be under the exclusive management and control of the Durbar.

"(9) For the ordinary maintenance and conservancy of these tanks, the Durbar to maintain a suitable establishment (costing, say, Rs. 300 a month) and the cost of this establishment to be shared equally between the City and the Civil and Military Station.

"(10) The restoration of these tanks, should there happen any accident to them, and the contribution of the British Government towards the cost of such restoration, to be reserved for mutual agreement at the time when the occasion arises.

"(11) The Durbar not to be liable for any diminution in, or interruption of, the required supply of water, arising from accident, failure of rains, or any other cause.

"(12) The cost of the telephone from Hessarghatta to Bangalore, and any other subsidiary works for the common use of the City and the Civil and Military Station, to be borne by both in equal shares."

13. The Durbar propose to call the Hessarghatta Tank and works after the name of His Highness the late Maharaja Chamarajendra Wodayar Bahadur, G.C.S.I.

14. I beg to append to this letter a memo of the conditions drawn up in accordance with the preceding paragraphs.

I have the honor to be,
Sir,
Your most obedient servant,
K. SHESHADRI IYER,
Dewan.

MEMO OF CONDITIONS.

1. The Civil and Military Station to draw from the delivery channel, by metre, the stipulated quantity of one million gallons a day ; provided that if, owing to short supply in the tank, only less than two million gallons per day can safely be drawn on any particular day for the supply of the Station and the City, the quantity actually drawn on such day to be divided equally between the Station and the City.

2. The Durbar to be at full liberty to use the water in the tank for purposes other than the supply of the Station and the City, to the extent of the water available in the tank, and the water level, below which the Durbar must not draw from the tank for such other purposes, to be fixed by mutual agreement. The other purposes mentioned in this clause shall be deemed to include irrigation.

3. Any removal of villages, prevention of cultivation, and other measures of sanitation (in addition to those already carried out by the Durbar) which the British Government may hereafter desire, to be paid for by the British Government.

4. Permission for the British Government to erect its own pumping machinery, to take off water from the Durbar's channel, and to lay its own pipes through the country intervening between that point and the Civil and Military Station.

5. The works for delivery of the water from the tank to the pumping stations (water tower, aqueducts, and channel) and their future improvement, repair and up-keep, as well as the workshop and its plant, and additions, improvements and repairs to the same, and the salary of the workshop staff, to be paid for by the City and the Civil and Military Station in equal shares, but to be under the management and control of the Durbar.

6. Abandonment of all claim on behalf of the British Government for refund of the Rs. 2,33,000 paid to the Durbar for compensation in the Maligal valley, leaving the Durbar to retain any sums that may be undisbursed, and to recover what it can from the people to whom compensation has been paid.

7. Abandonment of all claim by the British Government upon the water of Sankey's Tank from the time when the Hessarghatta water is brought into the Civil and Military Station of Bangalore.

8. Hessarghatta and the minor tanks included in the scheme and the catchment area of the same to be under the exclusive management and control of the Durbar.

9. For the ordinary maintenance and conservancy of these tanks, the Durbar to maintain a suitable establishment (costing, say, Rs. 300 a month) and the cost of this establishment to be shared equally between the City and the Civil and Military Station.

10. The restoration of these tanks, should there happen any accident to them, and the contribution of the British Government towards the cost of such restoration, to be reserved for mutual agreement at the time when the occasion arises.

11. The Durbar not to be liable for any diminution in, or interruption of, the required supply of water, arising from accident, failure of rains, or any other cause.

12. The cost of the telephone from Hessarghatta to Bangalore, and any other subsidiary works for the common use of the City and the Civil and Military Station, to be borne by both in equal shares.

K. S.

: 3863 En: three

INDIAN TELEGRAPH. Monthly Local Rs 250

Jalore (entire) Via Saklespur

Words.	Days.	Hours.	Minutes.	Charges.
33	1	16	10	10 + (11)

(Person)

Queen of Mysore

Postmaster Kadlepet.

Queen wishes Queen Of Mysore
for reply Wishing Queen's
Birthday from Mysore Palace
to Banglalore Station
Please wire when
may expect Sandoor
Reply

(BANGALORE JAN 16 96)

To the Dewan (final)
Submitted
for orders on the
above. attended
16/1/96

From	L. N.	Sent to	L. N.
Hrs.	Mts. By	At	Hrs. Mts. Dy

Postmaster.

RATES OF CHARGE FOR INLAND TELEGR

The address (including name of Sender, and name and residence of Address) is transmitted free.

	First 8 words.	Each additional word.	
Deferred Message	... 8 Annas	... 1 Anna	A group of less figures reckoned word.
Ordinary "	... 1 Rupee	... 2 Annas.	
Urgent "	... 2 Rupees	... 4 Annas.	

No charge for delivery within a distance of 5 Miles.

Sakleshpur

From

To The Resident in Mys. ...
Camp Hebsala

Or

Reply regarding Water Supply
posted today to Hindy

16 June 1.8

Disp.
Rec. 16/1

N°: 3863. En: three

13

From,

The First Assistant to the
Resident in Mysore.

To,
The Dewan of Mysore,
Bangalore.

Dated Bangalore, 23d. October 1896

Sir,

I am directed to invite a reference to your letter No. 48 D dated the 13th January 1896 on the subject of a water supply for the civil and military Station. In paragraph 5 thereof you conveyed the acceptance by the Durbar of the main proposals specified in my

Submitted to Her Highness the Maharani Regent in continuation of previous correspondence ending with my letter of 13 Jany 96. The Govt of India have had to take legal opinion in the matter — The Draft Agreement requires alteration upon one or two points, and there I beg to be permitted to settle with the Resident when I return to Bangalore — I refer particularly to Clauses 3(c), 8 & 11 of the Draft Agreement which differ materially from what we had agreed to —

Yesterday for 1 hour 9/6.

The above was explained by me in person to Her Highness, who was pleased generally to approve of my proposals — by 7 4 96

letter No. 4820 dated the 5th December 1895, and for this acceptance the thanks of the Resident are due.

2. A copy of your letter above quoted was submitted for the consideration of the Government of India and their reply has now been received. The proposal to commemorate the memory of His Highness the late Maharaja in connection with the present scheme is cordially approved by the Government of India, who also agree to include the water tower among the works the cost of which is to be

equally divided between the Government of India and the Mysore State, and further, in consideration of the assistance rendered by the Durbar, to waive their claim over any water in the reservoir in excess of the amount decided to be the safe minimum supply for the time being for the station and city of Bangalore.

3. I am now to enclose a copy of an agreement which the Government of India are prepared to execute. It has been drawn by the Solicitor to Government on the lines indicated above and seems to fit

With 2 spare copies.

call for no

explanation. The Resident

would be glad to be informed

at a very early date if the

agreement meets with the ap-

proval of the Durbar.

I have the honor to be,

Sir,

Your most obedient Servant

Sd K. D. Erskine

First Assistant Resident.

Memorandum of Agreement made this day of 1896 between THE SECRETARY OF STATE FOR INDIA IN COUNCIL (hereinafter referred to as the Secretary of State which term shall include the Secretary of State party hereto his successors in office and assigns) of the one part and HIS HIGHNESS SRI KRISHNA WOODAYAR BAHADUR MAHARAJA OF MYSORE (hereinafter referred to as the Maharaja which term shall include the Maharaja of Mysore party hereto and his successors) of the other part.

WHEREAS the Government of Mysore has through Sir K. Sheshadri Iyer, K.C.S.I., the Dewan of Mysore and *ex-officio* President of the Council of the said Government agreed to allow the British Government to obtain from the Chamrajendra Reservoir and the minor tanks connected therewith (hereinafter called the Chamrajendra Reservoir) a supply of water for the Civil and Military station of Bangalore (hereinafter called the Station) upon the terms and subject to the conditions hereinafter expressed. NOW THESE PRESENTS WITNESS that it is hereby mutually agreed between the parties hereto as follows:—

1. The Secretary of State shall relinquish all claim to a refund of the sum of Rs. 2,33,000 paid by the Secretary of State to the Maharaja to provide compensation to the occupants of the Maligal valley in connection with the scheme for the supply of water to the station from the Maligal valley, known as the Maligal Scheme, and the Maharaja shall be at liberty to retain any sum that may still remain undisbursed of the said sum of Rs. 2,33,000 and to take such steps as he may think fit to recover the sums already disbursed from the persons to whom compensation may have from time to time been paid in connection with the said Maligal Scheme.

2. The Secretary of State shall relinquish all claim to the use of the water from the tank known as Sankey's Tank from the date on which the supply of water from the Chamrajendra Reservoir for the Station to be provided under this Agreement is established and in full working order.

3. In consideration of the water-supply to be provided under this Agreement the Secretary of State agrees to pay the Maharaja half the cost of the following items:—

(*a*) The construction, completion, repair and maintenance of the water tower, the masonry delivery channel and aqueducts (except that portion between No. VI acqueduct and the pumping station known as the Darbar pumping station), the workshop and the workshop plant which are to be constructed, completed, repaired and maintained by, and at the expense of, the Maharaja for the purpose of the said water-supply.

(*b*) The restoration of the Chamrajendra Reservoir should any accident happen to it.

(*c*) Any additional works or establishments or protective or sanitary measures in connection with the said water-supply, to the execution or entertainment or adoption of which the Secretary of State and the Maharaja may hereafter mutually agree.

4. In consideration of the relinquishment by the Secretary of State of all claim to a refund of the sum of Rs. 2,33,000 mentioned in clause 1 hereof and in consideration of the payment by the Secretary of State to the Maharaja of the sums provided under clause 3 hereof, the Maharaja agrees to construct, complete, repair and maintain the Chamrajendra Reservoir and all works connected therewith, which are to be used in common by the Government of India and the Government of Mysore, the said Reservoir and all works connected therewith to be at all times under the exclusive management and control of the officers of the Government of Mysore. PROVIDED ALWAYS that all officers of the Government of India duly authorised in that behalf shall have free access to the Chamrajendra Reservoir and all works connected therewith for the purpose of inspecting and reporting as to their condition and safety.

5. The Maharaja shall, through the Government of Mysore, consult the Secretary of State, through the Government of India, and the consent of the Secretary of State, through the Government of India, shall be obtained in regard to all measures to be adopted in cases of anticipated or actual failure or ~~deterioration~~ of the supply of water to be provided under this Agreement, or on the occasion of extensive alterations in or repairs to the storage works or the works for the delivery of the water, which are to be used in common by the Government of India and the Government of Mysore ~~or which affect the common supply of water to the two Governments.~~ The measures to be adopted shall be carried out by the Maharaja and the cost thereof shall be defrayed as hereinbefore provided by clause 3 ~~(c)~~ (d)

defrayed

6. The Maharaja shall not be responsible for any loss which may arise or be occasioned to the Secretary of State or the Government of India in consequence of any diminution in or interruption of the supply of water required by the Station arising from accident, failure of the rains or any other cause beyond the control of the Maharajah or the Government of Mysore.

7. The Maharaja shall allow the Secretary of State to erect the pumping machinery required by the Government of India, to take off water from the channel from the Chamrajendra Reservoir belonging to the Maharaja and to lay the pipes required by the Government of India through the country lying between the point where the water is taken off and the station, the Secy. of State paying the cost of acquiring the land required for the pumping

8. The Secretary of State ~~and the Maharaja~~ shall have ~~equal rights in the water obtained~~ from the Chamrajendra Reservoir for the purpose of supplying the Station ~~and the city of Bangalore (hereinafter called the City) respectively with a sufficient supply of water~~. For seven years from the date of this Agreement one million gallons ~~each~~ per diem shall be held to be a sufficient water-supply for the Station ~~and the City respectively~~. At the end of seven years from the date of this Agreement it shall be decided by the officers of the Government of India and the officers of the Government of Mysore duly authorised in that behalf what quantity of water shall, thereafter, be held to be a sufficient water-supply for the Station ~~and the City respectively~~. ~~In all other respects the rights of the Secretary of State and the Maharaja respectively in the water of the Chamrajendra Reservoir shall remain unaltered.~~

the rights to obtain a sufficient supply of water

the Sufficient Water Supply for the Station fixed or determined hereafter called "the Stipulated"

9. The officers of the Government of India and the officers of Government of Mysore duly authorised in that behalf shall agree from time to time as

to the height of water in the Chamrajendra Reservoir which shall, at different seasons of the year, be taken to be a safe minimum level for ensuring a continuous supply of water ~~to the Station and the City with reference to the requirements of the Station and the City respectively~~.

10. If at any time the water in the Chamrajendra Reservoir shall stand at a higher level than that fixed as the safe minimum level for that season of the year, the water which shall in consequence become available ~~and shall not be required for the purposes of this Agreement~~ shall be at the absolute disposal of the Maharaja or the Government of Mysore.

11. If at any time the water in the Chamrajendra Reservoir shall fall to the level fixed as the safe minimum level for that season of the year, the whole of the water of the Chamrajendra Reservoir shall be reserved exclusively for the supply of the Station and the City, and the Maharaja and the Government of Mysore shall not be entitled to draw off any water from the Chamrajendra Reservoir for any other purpose whatsoever until the water in the Chamrajendra Reservoir has again risen above the safe minimum level; and until the water shall be above the safe minimum level, the quantity of water to be drawn daily for the water-supply of ~~the Station and~~ the City shall be limited to the quantity ~~forming the basis of the calculation of the safe minimum level and the same shall be supplied to the Station and the City in equal quantities.~~

12. If at any time the water in the Chamrajendra Reservoir shall stand at a lower level than that fixed as the safe minimum level for that season of the year, the officers of the Government of India and the officers of the Government of Mysore duly authorised in that behalf shall consult together as to the measures to be taken in consequence and on their agreeing that the supply of water must be reduced below the quantity ~~up to that time held to be a sufficient water-supply~~, the supply of water ~~both to the Station and~~ to the City shall be reduced ~~in equal quantities~~.

13. If any difference or dispute shall at any time arise between the Secretary of State or the Government of India, on the one part, and the Maharaja or the Government of Mysore, on the other part, in regard to the necessity for or the manner of the carrying out of any works or repairs, the entertainment of any establishment, or the adoption of any protective or sanitary measures in connection with the supply of water from the Chamrajendra Reservoir, or in regard to any other matter arising out of this Agreement, the matter in difference or dispute shall be referred to the decision of an arbitrator to be agreed upon and appointed by the Secretary of State and the Maharaja, and the decision of such arbitrator shall be final and binding upon the parties hereto.

MEMORANDUM OF AGREEMENT made this day of 1896 between THE SECRETARY OF STATE FOR INDIA IN COUNCIL (hereinafter referred to as the Secretary of State which term shall include the Secretary of State party hereto his successors in office and assigns) of the one part and HIS HIGHNESS SRI KRISHNA WOODAYAR BAHADUR MAHARAJA OF MYSORE (hereinafter referred to as the Maharaja which term shall include the Maharaja of Mysore party hereto and his successors) of the other part.

WHEREAS the Government of Mysore has through Sir K. Sheshadri Iyer, K. C. S. I., the Dewan of Mysore and *ex-officio* President of the Council of the said Government agreed to allow the British Government to obtain from the Chamrajendra Reservoir and the minor tanks connected therewith (hereinafter called the Chamrajendra Reservoir) a supply of water for the Civil and Military Station of Bangalore (hereinafter called the Station) upon the terms and subject to the conditions hereinafter expressed. NOW THESE PRESENTS WITNESS that it is hereby mutually agreed between the parties hereto as follows :—

1. The Secretary of State shall relinquish all claim to a refund of the sum of Rs. 2,33,000 paid by the Secretary of State to the Maharaja to provide compensation to the occupants of the Maligal valley in connection with the scheme for the supply of water to the Station from the Maligal valley, known as the Maligal Scheme, and the Maharaja shall be at liberty to retain any sum that may still remain undisbursed of the said sum of Rs. 2,33,000 and to take such steps as he may think fit to recover the sums already disbursed from the persons to whom compensation may have, from time to time, been paid in connection with the said Maligal Scheme.

2. The Secretary of State shall relinquish all claim to the use of the water from the tank known as Sankey's Tank from the date on which the supply of water from the Chamrajendra Reservoir for the Station to be provided under this Agreement is established and in full working order.

3. In consideration of the water-supply to be provided under this Agreement the Secretary of State agrees to pay the Maharaja half the cost of the following items :—

(*a*) The construction, completion, repair and maintenance of the water tower, the masonry delivery channel and aqueducts (except that portion between No. VI acqueduct and the pumping station known as the Darbar pumping station), the workshop and the workshop plant which are to be constructed, completed, repaired and maintained by, and at the expense of, the Maharaja for the purpose of the said water-supply.

(*b*) The restoration of the Chamrajendra Reservoir should any accident happen to it.

(*c*) Any additional works or establishments or protective or sanitary measures in connection with the said water-supply, to the execution or entertainment or adoption of which the Secretary of State and the Maharaja may hereafter mutually agree.

4. In consideration of the relinquishment by the Secretary of State of all claim to a refund of the sum of Rs. 2,33,000 mentioned in clause 1 hereof and in consideration of the payment by the Secretary of State to the Maharaja of the sums provided under clause 3 hereof, the Maharaja agrees to construct, complete, repair and maintain the Chamrajendra Reservoir and all works connected therewith, which are to be used in common by the Government of India and the Government of Mysore, the said Reservoir and all works connected therewith to be at all times under the exclusive management and control of the Officers of the Government of Mysore. PROVIDED ALWAYS that all Officers of the Government of India duly authorized in that behalf shall have free access to the Chamrajendra Reservoir and all works connected therewith for the purpose of inspecting and reporting as to their condition and safety.

5. The Maharaja shall, through the Government of Mysore, consult the Secretary of State, through the Government of India, and the consent of the Secretary of State, through the Government of India, shall be obtained in regard to all measures to be adopted in cases of anticipated or actual failure or deterioration of the supply of water to be provided under this Agreement, or on the occasion of extensive alterations in or repairs to the storage works or the works for the delivery of the water, which are to be used in common by the Government of India and the Government of Mysore or which affect the common supply of water to the two Governments. The measures to be adopted shall be carried out by the Maharaja and the cost thereof shall be defrayed as hereinbefore provided by clause 3 (*c*).

6. The Maharaja shall not be responsible for any loss which may arise or be occasioned to the Secretary of State or the Government of India in consequence of any diminution in or interruption of the supply of water required by the Station arising from accident, failure of the rains or any other cause beyond the control of the Maharaja or the Government of Mysore.

7. The Maharaja shall allow the Secretary of State to erect the pumping machinery required by the Government of India, to take off water from the channel from the Chamrajendra Reservoir belonging to the Maharaja and to lay the pipes required by the Government of India through the country lying between the point where the water is taken off and the Station.

8. The Secretary of State and the Maharaja shall have equal rights in the water obtained from the Chamrajendra Reservoir for the purpose of supplying the Station and the City of Bangalore (hereinafter called the City) respectively with a sufficient supply of water. For seven years from the date of this Agreement, one million gallons each per diem shall be held to be a sufficient water-supply for the Station and the City, respectively. At the end of seven years from the date of this Agreement it shall be decided by the Officers of the Government of India and the officers of the Government of Mysore duly authorized in that behalf what quantity of water shall, thereafter, be held to be a sufficient water-supply for the Station and the City respectively. In all other respects the rights of the Secretary of State and the Maharaja respectively in the water of the Chamrajendra Reservoir shall remain unaltered.

9. The Officers of the Government of India and the Officers of Government of Mysore duly authorized in that behalf shall agree from time to time as

to the height of water in the Chamrajendra Reservoir which shall, at different seasons of the year, be taken to be a safe minimum level for ensuring a continuous supply of water to the Station and the City with reference to the requirements of the Station and the City respectively.

10. If at any time the water in the Chamrajendra Reservoir shall stand at a higher level than that fixed as the safe minimum level for that season of the year, the water which shall in consequence become available and shall not be required for the purposes of this Agreement shall be at the absolute disposal of the Maharaja or the Government of Mysore.

11. If at any time the water in the Chamrajendra Reservoir shall fall to the level fixed as the safe minimum level for that season of the year, the whole of the water of the Chamrajendra Reservoir shall be reserved exclusively for the supply of the Station and the City, and the Maharaja and the Government of Mysore shall not be entitled to draw off any water from the Chamrajendra Reservoir for any other purpose whatsoever until the water in the Chamrajendra Reservoir has again risen above the safe minimum level; and until the water shall be above the safe minimum level, the quantity of water to be drawn daily for the water-supply of the Station and the City shall be limited to the quantity forming the basis of the calculation of the safe minimum level and the same shall be supplied to the Station and the City in equal quantities.

12. If at any time the water in the Chamrajendra Reservoir shall stand at a lower level than that fixed as the safe minimum level for that season of the year, the Officers of the Government of India and the Officers of the Government of Mysore duly authorised in that behalf shall consult together as to the measures to be taken in consequence and on their agreeing that the supply of water must be reduced below the quantity up to that time held to be a sufficient water-supply, the supply of water both to the Station and to the City shall be reduced in equal quantities.

13. If any difference or dispute shall at any time arise between the Secretary of State or the Government of India, on the one part, and the Maharaja or the Government of Mysore, on the other part, in regard to the necessity for or the manner of the carrying out of any works or repairs, the entertainment of any establishment, or the adoption of any protective or sanitary measures in connection with the supply of water from the Chamrajendra Reservoir, or in regard to any other matter arising out of this Agreement, the matter in difference or dispute shall be referred to the decision of an arbitrator to be agreed upon and appointed by the Secretary of State and the Maharaja, and the decision of such arbitrator shall be final and binding upon the parties hereto.

32 D.

Office of the Dewan of Mysore

Dated Bangalore, 3d November 1896

From,

The Dewan of Mysore

To,

The Resident in Mysore.

Sir,

I have the honor to acknowledge the receipt of Residency letter No. 3863 dated 23d October 1896, regarding the supply of Water to the Civil and Military Station of Bangalore. The cordial approval by the British Gov-

ernment of the proposal to commemorate the Memory of His Highness the late Maha-raja in connection with the Hessarghatta Water Works, is a source of special grati-fication to Her Highness the Maharani - Regent and to the Durbar.

2. The Mysore Gov-ernment has very carefully studied the Draft Agree-ment received with the letter under acknowledgment, with special reference to possible questions which may arise hereafter in the construction

of a formal document of this nature. Some amendments and improvements suggest themselves to the Durban as necessary for the smooth and satisfactory working of the proposed scheme of joint supply to the Station and the City. These suggestions are described in full detail in Appendix A which contains the Draft Agreement as drawn up by the Government Solicitor with the amendments now proposed by the Durban, printed in juxta position

I beg to add that these amendments do not in any way alter the basis or features of the proposed scheme of joint supply, but are only intended to make clear what otherwise might be regarded as doubtful: and to lay down in express terms the principles on which to adjust the supply from time to time to the respective future requirement of both the Station and the city. They moreover are in accordance with the terms of the

Durbar's acceptance as con-
veyed in my letter No. 48-
D dated 13th January 1896

3. Under such cir-
cumstances and after an
attentive study of the Draft
Agreement received with
the letter under reply, I
beg to submit for your
consideration the amend-
ments as per Appendix A
(together with a brief
statement of the reasons
therefor as per Appendix B),
in the hope that they
will commend the[illegible]

(18)

No. 32 D.

OFFICE OF THE DEWAN OF MYSORE,
DATED, BANGALORE, 3RD DECEMBER 1896.

FROM

THE DEWAN OF MYSORE

To

THE RESIDENT IN MYSORE.

SIR,

I have the honor to acknowledge the receipt of Residency letter No. 3863, dated 23rd October 1896, regarding the supply of water to the Civil and Military Stations of Bangalore. The cordial approval by the British Government of the proposal to commemorate the memory of His Highness the late Maharaja in connection with the Hesserghatta Water-works, is a source of special gratification to Her Highness the Maharani-Regent and to the Durbar.

F.O. 28

I believe Mr. Young is recommended to Government the acceptance of the amendments proposed by me herein. This may accordingly be noted and filed.

[illegible] K. S.

-12-96

2. The Mysore Government has very carefully studied the Draft Agreement received with the letter under acknowledgment, with special reference to possible questions which may arise hereafter in the construction of a formal document of this nature. Some amendments and improvements suggest themselves to the Durbar as necessary for the smooth and satisfactory working of the proposed scheme of joint supply to the Station and the City. These suggestions are described in full detail in Appendix A which contains the Draft Agreement as drawn up by the Government Solicitor with the amendments now proposed by the Durbar printed in juxta-position. I beg to add that these amendments do not in any way alter the basis or features of the proposed scheme of joint supply, but are only intended to make clear what otherwise might be regarded as doubtful.

3. Under such circumstances, and after an attentive study of the Draft Agreement received with the letter under reply, I beg to submit for your consideration the amendments as per Appendix A (together with a brief statement of the reasons therefor as per Appendix B), in the hope that they will commend themselves to the Government of India as suitable in every way, and receive its ready approval at an early date.

4. The proviso proposed to be added to Clause 3 (*d*) is in accordance with what we mutually accepted as one of the conditions of the proposed joint-supply. But should the Government of India consider it unnecessary, owing to the express provision for the mutual agreement of both parties which the clause under consideration already contains, then in that case the Durbar will dispense with the proposed proviso.

I have the honor to be,
Sir,
Your most obedient servant,
K. SHESHADRI IYER,
Dewan of Mysore.

APPENDIX A.

Draft Agreement received with Residency letter No. 3863, dated 23rd October 1896

and

Amendments proposed by the Durbar.

Draft Agreement received with Residency letter No. 3863, *dated* 23*rd October* 1896.

MEMORANDUM OF AGREEMENT made this day of 1896 between THE SECRETARY OF STATE FOR INDIA IN COUNCIL (hereinafter referred to as the Secretary of State which term shall include the Secretary of State party hereto his successors in office and assigns) of the one part and HIS HIGHNESS SRI KRISHNA WOODAYAR BAHADUR MAHARAJA OF MYSORE (hereinafter referred to as the Maharaja which term shall include the Maharaja of Mysore party hereto and his successors) of the other part.

WHEREAS the Government of Mysore has through Sir K. Sheshadri Iyer, K. C. S. I., the Dewan of Mysore and *ex-officio* President of the Council of the said Government agreed to allow the British Government to obtain from the Chamrajendra Reservoir and the minor tanks connected therewith (hereinafter called the Chamrajendra Reservoir) a supply of water for the Civil and Military Station of Bangalore (hereinafter called the Station) upon the terms and subject to the conditions hereinafter expressed. NOW THESE PRESENTS WITNESS that it is hereby mutually agreed between the parties hereto as follows :—

1. The Secretary of State shall relinquish all claim to a refund of the sum of Rs. 2,33,000 paid by the Secretary of State to the Maharaja to provide compensation to the occupants of the Maligal valley in connection with the scheme for the supply of water to the Station from the Maligal valley, known as the Maligal Scheme, and the Maharaja shall be at liberty to retain any sum that may still remain undisbursed of the said sum of Rs. 2,33,000 and to take such steps as he may think fit to recover the sums already disbursed from the persons to whom compensation may have, from time to time, been paid in connection with the said Maligal Scheme.

2. The Secretary of State shall relinquish all claim to the use of the water from the tank known as Sankey's Tank from the date on which the supply of water from the Chamrajendra Reservoir for the Station to be provided under this Agreement is established and in full working order.

3. In consideration of the water-supply to be provided under this Agreement the Secretary of State agrees to pay the Maharaja half the cost of the following items :—

(*a*) The construction, completion, repair and maintenance of the water tower, the masonry delivery channel and aqueducts (except that portion between No. VI aqueduct and the pumping station known as the Darbar pumping station), the workshop and the workshop plant which are to be constructed, completed, repaired and maintained by, and at the expense of, the Maharaja for the purpose of the said water-supply.

(*b*) The restoration of the Chamrajendra Reservoir should any accident happen to it.

Amendments proposed by the Durbar.

3. In consideration of the water-supply to be provided under this Agreement the Secretary of State agrees to pay the Maharaja half the cost of the following items :—

(*a*) The construction, completion, repair and maintenance and the restoration, in case of accident, of the water-tower, the masonry delivery channel and aqueducts (except that portion between No. VI aqueduct and the pumping station known as the Durbar Pumping Station), the workshop and the workshop plant which are to be constructed, completed, repaired, maintained and restored by, and at the expense of, the Maharaja for the purpose of the said water-supply.

(*b*) The ordinary maintenance and conservancy of the Chamarajendra Re-

(*c*) Any additional works or establishments or protective or sanitary measures in connection with the said water-supply, to the execution or entertainment or adoption of which the Secretary of State and the Maharaja may hereafter mutually agree.

4. In consideration of the relinquishment by the Secretary of State of all claim to a refund of the sum of Rs. 2,33,000 mentioned in clause 1 hereof and in consideration of the payment by the Secretary of State to the Maharaja of the sums provided under clause 3 hereof, the Maharaja agrees to construct, complete, repair and maintain the Chamrajendra Reservoir and all works connected therewith, which are to be used in common by the Government of India and the Government of Mysore, the said Reservoir and all works connected therewith to be at all times under the exclusive management and control of the Officers of the Government of Mysore. PROVIDED ALWAYS that all Officers of the Government of India duly authorized in that behalf shall have free access to the Chamrajendra Reservoir and all works connected therewith for the purpose of inspecting and reporting as to their condition and safety.

5. The Maharaja shall, through the Government of Mysore, consult the Secretary of State, through the Government of India, and the consent of the Secretary of State, through the Government of India, shall be obtained in regard to all measures to be adopted in cases of anticipated or actual failure or deterioration of the supply of water to be provided under this Agreement, or on the occasion of extensive alterations in or repairs to the storage works or the works for the delivery of the water, which are to be used in common by the Government of India and the Government of Mysore or which affect the common supply of water to the two Governments. The measures to be adopted shall be carried out by the Maharaja and the cost thereof shall be defrayed as hereinbefore provided by clause 3 (*c*).

6. The Maharaja shall not be responsible for any loss which may arise or be occasioned to the Secretary of State or the Government of India in consequence of any diminution in or interruption of the supply of water required by the Station arising from accident, failure of the rains or any other cause beyond the control of the Maharaja or the Government of Mysore.

7. The Maharaja shall allow the Secretary of State to erect the pumping machinery required by the Government of India, to take off water from the channel from the Chamrajendra Reservoir belonging to the Maharaja and to lay the pipes required by the Government of India through the country lying between the point where the water is taken off and the Station.

Amendments proposed by the Durbar.

(*c*) The restoration of the Chamarajendra Reservoir should any accident happen to it.

(*d*) Any additional works or any establishments or protective or sanitary measures in connection with the said water-supply, to the execution or entertainment or adoption of which the Secretary of State and the Maharaja may hereafter mutually agree. Provided that, should at any time hereafter the Secretary of State be dissatisfied with the quality of the water in the Chamarajendra Reservoir and desire to improve it by the acquisition of additional inhabited villages or cultivated lands in the catchment of the said Reservoir, and should the Maharaja not agree to share the cost of such acquisition with the Secretary of State, then the entire cost of such acquisition shall be wholly paid by the Secretary of State.

5. The Maharaja shall, through the Government of Mysore, consult the Secretary of State, through the Government of India, and the consent of the Secretary of State, through the Government of India, shall be obtained in regard to all measures to be adopted in cases of anticipated or actual failure or deficiency of the supply of water to be provided under this Agreement or on the occasion of extensive alterations in or repairs to the storage works or the works for the delivery of the water, which are to be used in common by the Government of India and the Government of Mysore or which affect the combined supply of water to the two Governments. The measures to be adopted shall be carried out by the Maharaja and the cost thereof shall be defrayed as hereinbefore provided by Clause 3 (*d*).

7. The Maharaja shall allow the Secretary of State to erect the pumping machinery required by the Government of India, to take off water from the channel from the Chamarajendra Reservoir belonging to the Maharaja and to lay the pipes required by the Government of India through the country lying between the point where the water is taken off and the station, the Secretary of State paying the cost of the lands required for the purpose.

8. The Secretary of State and the Maharaja shall have equal rights in the water obtained from the Chamrajendra Reservoir for the purpose of supplying the Station and the City of Bangalore (hereinafter called the City) respectively with a sufficient supply of water. For seven years from the date of this Agreement, one million gallons each per diem shall be held to be a sufficient water-supply for the Station and the City, respectively. At the end of seven years from the date of this Agreement it shall be decided by the Officers of the Government of India and the officers of the Government of Mysore duly authorized in that behalf what quantity of water shall, thereafter, be held to be a sufficient water supply for the Station and the City respectively. In all other respects the rights of the Secretary of State and the Maharaja respectively in the water of the Chamrajendra Reservoir shall remain unaltered.

9. The Officers of the Government of India and the Officers of Government of Mysore duly authorized in that behalf shall agree from time to time as to the height of water in the Chamrajendra Reservoir which shall, at different seasons of the year, be taken to be a safe minimum level for ensuring a continuous supply of water to the Station and the City with reference to the requirements of the Station and the City respectively.

10. If at any time the water in the Chamrajendra Reservoir shall stand at a higher level than that fixed as the safe minimum level for that season of the year, the water which shall in consequence become available and shall not be required for the purposes of this Agreement shall be at the absolute disposal of the Maharaja or the Government of Mysore.

11. If at any time the water in the Chamrajendra Reservoir shall fall to the level fixed as the safe minimum level for that season of the year, the whole of the water of the Chamrajendra Reservoir shall be reserved exclusively for the supply of the Station and the City, and the Maharaja and the Government of Mysore shall not be entitled to draw off any water from the Chamrajendra Reservoir for any other purpose whatsoever until the water in the Chamrajendra Reservoir has again risen above the safe minimum level; and until the water shall be above the safe minimum level, the quantity of water to be drawn daily for the water-supply of the Station and the City shall be limited to the quantity forming the basis of the calculation of the safe minimum level and the same shall be supplied to the Station and the City in equal quantities.

12. If at any time the water in the Chamrajendra Reservoir shall stand at a lower level than that fixed as the safe minimum level for that season of the year, the Officers of the Government of India and the Officers of the Government of Mysore duly authorised in that behalf shall consult together as to the measures to be taken in consequence and on their agreeing that the supply of water must be reduced below the quantity up to that time held to be a sufficient water-supply, the supply of water both to the Station and to the City shall be reduced in equal quantities.

Amendments proposed by the Durbar

8. The Secretary of State and the Maharaja shall have equal rights in the water obtained from the Chamarajendra Reservoir for the purpose of supplying the Station and the City of Bangalore (hereinafter called the City) respectively with a sufficient supply of water. For seven years from the date of this Agreement, one million gallons each per diem shall be held to be a sufficient water-supply for the Station and the City, respectively. At the end of seven years from the date of this Agreement and once in every ten years after that period it shall be decided by the Officers of the Government of India and the Officers of the Government of Mysore duly authorized in that behalf what quantity of water shall, thereafter, be held to be a sufficient water-supply for the Station and the City respectively, the quantity for the Station and that for the City thus to be fixed being equal to each other. In all other respects the rights of the Secretary of State and the Maharaja respectively in the water of the Chamarajendra Reservoir shall remain unaltered.

9. The Officers of the Government of India and the Officers of the Government of Mysore duly authorized in that behalf shall agree from time to time as to the height of water in the Chamarajendra Reservoir which shall, at different seasons of the year, be taken to be a safe minimum level for ensuring a continuous supply of water to the Station and the City with reference to the water-supply of the Station and the City respectively, as fixed under Clause 8 above.

Sd- K. Seshadri Iyer
Dewan

Draft Agreement received with Residency Letter No. 3863, *dated* 23*rd October* 1896.

13. If any difference or dispute shall at any time arise between the Secretary of State or the Government of India, on the one part, and the Maharaja or the Government of Mysore, on the other part, in regard to the necessity for or the manner of the carrying out of any works or repairs, the entertainment of any establishment, or the adoption of any protective or sanitary measures in connection with the supply of water from the Chamrajendra Reservoir, or in regard to any other matter arising out of this Agreement, the matter in difference or dispute shall be referred to the decision of an arbitrator to be agreed upon and appointed by the Secretary of State and the Maharaja, and the decision of such arbitrator shall be final and binding upon the parties hereto.

APPENDIX A.

Draft Agreement received with Residency letter No. 3863, dated 23rd October 1896

and

Amendments proposed by the Durbar.

Draft Agreement received with Residency letter No. 3863, dated 23rd October 1896.

MEMORANDUM OF AGREEMENT made this Seventeenth day of February 1897 between THE SECRETARY OF STATE FOR INDIA IN COUNCIL (hereinafter referred to as the Secretary of State which term shall include the Secretary of State party hereto his successors in office and assigns) of the one part and HIS HIGHNESS SRI KRISHNA WOODAYAR BAHADUR MAHARAJA OF MYSORE (hereinafter referred to as the Maharaja which term shall include the Maharaja of Mysore party hereto and his successors) of the other part.

(in consideration of the Secy of State relinquishing the claims mentioned in clauses 1 and 2 of this Agreem

WHEREAS the Government of Mysore has through Sir K. Sheshadri Iyer, K. C. S. I., the Dewan of Mysore and *ex-officio* President of the Council of the said Government agreed to allow the British Government to obtain from the Chamrajendra Reservoir and the minor tanks connected therewith (hereinafter called the Chamrajendra Reservoir) a supply of water for the Civil and Military Station of Bangalore (hereinafter called the Station) upon the terms and subject to the conditions hereinafter expressed. NOW THESE PRESENTS WITNESS that it is hereby mutually agreed between the parties hereto as follows :—

1. The Secretary of State shall (for the consideration aforesaid) relinquish all claim to a refund of the sum of Rs. 2,33,000 paid by the Secretary of State to the Maharaja to provide compensation to the occupants of the Maligal valley in connection with the scheme for the supply of water to the Station from the Maligal valley, known as the Maligal Scheme, and the Maharaja shall be at liberty to retain any sum that may still remain undisbursed of the said sum of Rs. 2,33,000 and to take such steps as he may think fit to recover the sums already disbursed from the persons to whom compensation may have, from time to time, been paid in connection with the said Maligal Scheme.

2. The Secretary of State shall (for the consideration aforesaid) relinquish all claim to the use of the water from the tank known as Sankey's Tank from the date on which the supply of water from the Chamrajendra Reservoir for the Station to be provided under this Agreement is established and in full working order.

3. In consideration of the water-supply to be provided under this Agreement the Secretary of State agrees to pay the Maharaja half the cost of the following items :—

(*a*) The construction, completion, repair and maintenance of the water tower, the masonry delivery channel and aqueducts (except that portion between No. VI aqueduct and the pumping station known as the Darbar pumping station), the workshop and the workshop plant which are to be constructed, completed, repaired and maintained by, and at the expense of, the Maharaja for the purpose of the said water-supply.

(*b*) The restoration of the Chamrajendra Reservoir should any accident happen to it.

~~*Amendments proposed by the Durbar.*~~

---

3. In consideration of the water-supply to be provided under this Agreement the Secretary of State agrees to pay to the Maharaja half the cost of the following items :—

(*a*) The construction, completion, repair and maintenance and the restoration, in case of accident, of the water-tower, the masonry delivery channel and aqueducts (except that portion between No. VI aqueduct and the pumping station known as the Durbar Pumping Station), the workshop and the workshop plant which are to be constructed, completed, repaired, maintained and restored by, and at the expense of, the Maharaja for the purpose of the said water-supply.

(*b*) The ordinary maintenance and conservancy of the Chamarajendra Reservoir, it being expressly agreed that the cost of the Establishment required therefor, half of which shall be paid by the Secretary of State shall not exceed Rs 300 a month.

Draft Agreement received with Residency Letter No. 3863, dated 23rd October 1896.

(c) Any additional works or establishments or protective or sanitary measures in connection with the said water-supply, to the execution or entertainment or adoption of which the Secretary of State and the Maharaja may hereafter mutually agree.

4. In consideration of the relinquishment by the Secretary of State of all claim to a refund of the sum of Rs. 2,33,000 mentioned in clause 1 hereof and in consideration of the payment by the Secretary of State to the Maharaja of the sums provided under clause 3 hereof, the Maharaja agrees to construct, complete, repair and maintain the Chamrajendra Reservoir and all works connected therewith, which are to be used in common by the Government of India and the Government of Mysore, the said Reservoir and all works connected therewith to be at all times under the exclusive management and control of the Officers of the Government of Mysore. PROVIDED ALWAYS that all Officers of the Government of India duly authorized in that behalf shall have free access to the Chamrajendra Reservoir and all works connected therewith for the purpose of inspecting and reporting as to their condition and safety.

5. The Maharaja shall, through the Government of Mysore, consult the Secretary of State, through the Government of India, and the consent of the Secretary of State, through the Government of India, shall be obtained in regard to all measures to be adopted in cases of anticipated or actual failure or deterioration of the supply of water to be provided under this Agreement, or on the occasion of extensive alterations in or repairs to the storage works or the works for the delivery of the water, which are to be used in common by the Government of India and the Government of Mysore or which affect the common supply of water to the two Governments. The measures to be adopted shall be carried out by the Maharaja and the cost thereof shall be defrayed as hereinbefore provided by clause 3 (c).

6. The Maharaja shall not be responsible for any loss which may arise or be occasioned to the Secretary of State or the Government of India in consequence of any diminution in or interruption of the supply of water required by the Station arising from accident, failure of the rains or any other cause beyond the control of the Maharaja or the Government of Mysore.

7. The Maharaja shall allow the Secretary of State to erect the pumping machinery required by the Government of India, to take off water from the channel from the Chamrajendra Reservoir belonging to the Maharaja and to lay the pipes required by the Government of India through the country lying between the point where the water is taken off and the Station.

~~Amendments proposed by the Durbar.~~

(c) The restoration of the Chamarajendra Reservoir should any accident happen to it.

(d) Any additional works or any establishments or protective or sanitary measures in connection with the said water-supply, to the execution or entertainment or adoption of which the Secretary of State and the Maharaja may hereafter mutually agree. Provided that, should at any time hereafter the Secretary of State be dissatisfied with the quality of the water in the Chamarajendra Reservoir and desire to improve it by the acquisition of additional inhabited villages or cultivated lands in the catchment of the said Reservoir, and should the Maharaja not agree to share the cost of such acquisition with the Secretary of State, then the entire cost of such acquisition shall be wholly paid by the Secretary of State. Provided also that the Maharaja shall give all facilities and assistance for the acquisition, at a reasonable price, of such villages and lands, and for the execution of all works deemed necessary by the Secretary of State.

5. The Maharaja shall, through the Government of Mysore, consult the Secretary of State, through the Government of India, and the consent of the Secretary of State, through the Government of India, shall be obtained in regard to all measures to be adopted in cases of anticipated or actual failure or ~~deficiency~~ deterioration of the supply of water to be provided under this Agreement or on the occasion of extensive alterations in or repairs to the storage works or the works for the delivery of the water, which are to be used in common by the Government of India and the Government of Mysore or which affect the combined supply of water to the two Governments. The measures to be adopted shall be carried out by the Maharaja and the cost thereof shall be defrayed as hereinbefore provided by the 1st paragraph of Clause 3 (d).

7. The Maharaja shall allow the Secretary of State to erect the pumping machinery required by the Government of India, to take off water from the channel from the Chamarajendra Reservoir belonging to the Maharaja and to lay the pipes required by the Government of India through the country lying between the point where the water is taken off and the station, the Secretary of State paying the cost of the lands required for the purpose.

Draft Agreement received with Residency Letter No. 3863, dated 23rd October 1896.

3. The Secretary of State and the Maharaja shall have equal rights in the water obtained from the Chamrajendra Reservoir for the purpose of supplying the Station and the City of Bangalore (hereinafter called the City) respectively with a sufficient supply of water. For seven years from the date of this Agreement, one million gallons each per diem shall be held to be a sufficient water-supply for the Station and the City, respectively. At the end of seven years from the date of this Agreement it shall be decided by the Officers of the Government of India and the officers of the Government of Mysore duly authorized in that behalf what quantity of water shall, thereafter, be held to be a sufficient water supply for the Station and the City respectively. In all other respects the rights of the Secretary of State and the Maharaja respectively in the water of the Chamrajendra Reservoir shall remain unaltered.

9. The Officers of the Government of India and the Officers of Government of Mysore duly authorized in that behalf shall agree from time to time as to the height of water in the Chamrajendra Reservoir which shall, at different seasons of the year, be taken to be a safe minimum level for ensuring a continuous supply of water to the Station and the City with reference to the requirements of the Station and the City respectively.

10. If at any time the water in the Chamrajendra Reservoir shall stand at a higher level than that fixed as the safe minimum level for that season of the year, the water which shall in consequence become available and shall not be required for the purposes of this Agreement shall be at the absolute disposal of the Maharaja or the Government of Mysore.

11. If at any time the water in the Chamrajendra Reservoir shall fall to the level fixed as the safe minimum level for that season of the year, the whole of the water of the Chamrajendra Reservoir shall be reserved exclusively for the supply of the Station and the City, and the Maharaja and the Government of Mysore shall not be entitled to draw off any water from the Chamrajendra Reservoir for any other purpose whatsoever until the water in the Chamrajendra Reservoir has again risen above the safe minimum level; and until the water shall be above the safe minimum level, the quantity of water to be drawn daily for the water-supply of the Station and the City shall be limited to the quantity forming the basis of the calculation of the safe minimum level and the same shall be supplied to the Station and the City in equal quantities.

12. If at any time the water in the Chamrajendra Reservoir shall stand at a lower level than that fixed as the safe minimum level for that season of the year, the Officers of the Government of India and the Officers of the Government of Mysore duly authorised in that behalf shall consult together as to the measures to be taken in consequence and on their agreeing that the supply of water must be reduced below the quantity up to that time held to be a sufficient water-supply, the supply of water both to the Station and to the City shall be reduced in equal quantities.

~~*Amendments proposed by the Umpire.*~~

8. The Secretary of State and the Maharaja shall have equal rights in the water obtained from the Chamarajendra Reservoir for the purpose of supplying the Station and the City of Bangalore (hereinafter called the City) respectively with a sufficient supply of water. For seven years from the date of this Agreement, one million gallons each per diem shall be held to be a sufficient water-supply for the Station and the City, respectively. At the end of seven years from the date of this Agreement and once in every ten years after that period it shall be decided by the Officers of the Government of India and the Officers of the Government of Mysore duly authorized in that behalf what quantity of water shall, thereafter, be held to be a sufficient water-supply for the Station and the City respectively, the quantity for the Station and that for the City thus to be fixed being equal to each other. In all other respects the rights of the Secretary of State and the Maharaja respectively in the water of the Chamarajendra Reservoir shall remain unaltered.

9. The Officers of the Government of India and the Officers of the Government of Mysore duly authorized in that behalf shall agree from time to time as to the height of water in the Chamarajendra Reservoir which shall, at different seasons of the year, be taken to be a safe minimum level for ensuring a continuous supply of water to the Station and the City with reference to the water-supply of the Station and the City respectively, as fixed under Clause 8 above.

~~Draft Agreement received with Residency Letter No. 3863, dated 23rd October 1896.~~

13. If any difference or dispute shall at any time arise between the Secretary of State or the Government of India, on the one part, and the Maharaja or the Government of Mysore, on the other part, in regard to the necessity for or the manner of the carrying out of any works or repairs, the entertainment of any establishment, or the adoption of any protective or sanitary measures in connection with the supply of water from the Chamrajendra Reservoir, or in regard to any other matter arising out of this Agreement, the matter in difference or dispute shall be referred to the decision of an arbitrator to be agreed upon and appointed by the Secretary of State and the Maharaja, and the decision of such arbitrator shall be final and binding upon the parties hereto.

In witness whereof the Dewan of Mysore acting for and on behalf of His Highness the Maharaja of Mysore has hereunto set his hand and the seal of the Government of Mysore this twenty ninth day of January 1897.

In the presence of
1. Sd/ K. Krishna Iyer
2 Sd/ A N Sivaganaam

Sd/ K. Sheshadri Iyer
Dewan of Mysore

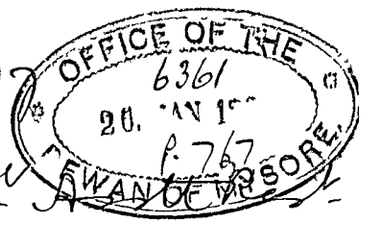
And the Secretary to the Government of India in the Foreign Department, acting for and on behalf of the Secretary of State has hereunto set his hand and the seal of the Government of India, this the seventeenth day of February 1897.

In the presence of
Sd) H. Daly.

Sd) W-J-Cunningham
Secretary to the
Government of India.

(20.)

189



From The Secretary to the Govt of Mysore, Dept.

To Dewan

~~The Secretary to the Govt of Mysore, Dept.~~

Dated 22-1-97

Despatched

Received

General No. C-47
No.

Enclosure No. 2

~~Forwarding an~~ agreement, in duplicate relating to the supply of water to the Cantonment Station, Bangalore from the Chamarajpuda Waterworks & requesting that if approved by the Darbar it may be duly executed for & on behalf of H.H. the Maharaja

References to be marked.

Send Copy of this letter & agreement & copy of reply to DWW. for information & record

4/2/97

Sir Seshadri Iyer

All copies sent to file

4-2-97

Already sent

Original

Camp No. 47 Dated 2.

FROM

THE FIRST ASSISTANT TO THE RESIDENT IN MYSORE.

To

The Dewan of Mysore

Bangalore,
Dated ~~Bangalore~~, 22nd January 1897.

SIR,

A copy of your letter No. 32-D of 3rd December 1896 and enclosures regarding the draft agreement relating to the supply of water to the civil and military station of Bangalore having been forwarded to the Government of India for consideration I am now directed to forward an agreement in duplicate and to request that, if approved by the Durbar, it may be duly executed by you "for and on behalf of His Highness the Maharaja".

2. The amendments suggested by the Durbar have generally been accepted by the Government of India as [illegible]

mitted to Her
mers the Maharani
nt - The revised
ement is suitable
ery way and it
ets all points on
ich I had before
ked for an alteration.
d if now finally
proved, I shall
ow execute
Agreement
rein requested.
Bangalore 27th
January 1897

Submitted
27th Jan 97

Approved
KVS
27.1.97

To the Durbar
27/1/97

clause 3 (b) it has been considered necessary to add the proviso that the monthly cost of the establishment entertained for the maintenance and conservancy of the Reservoir shall not exceed Rs 300/- This is in accordance with Paragraph 12 of your letter no $\frac{48}{D}$, dated the 13th January 1896, and clause 9 of the memo of conditions attached thereto.

3. The Government of India have accepted the proviso to clause 3 (d) added by the Durbar but it has been stipulated that when the maharaja does not desire to join in the improvements thought necessary by the British Government His Highness shall give all facilities and assistance for the acquisition at a reasonable price of inhabited villages and cultivated lands and for the erection of all works deemed necessary by the Secretary of State.

4 As regards clause 5 the Government of India prefer the word "deterioration"

as it expresses the intention of the Cl
whereas the word "deficiency" Sugg
by the Durbar does not

5. The agreement as now
seem to render any further discussio
of the water supply scheme unne
and in the interests of the civil an
military station, especially in or
to obviate the lapse of any
of the allotment for the current year
am to ask you to be kinde
to return both drafts duly signe
at the earliest possible date.

I have the honor to be,
Sir,
Your most obedient
k [illegible] Capt
First Assistant to the Resi

87

clause 3 (b) it has been considered necessary to add the proviso that the monthly cost of the establishment entertained for the maintenance and conservancy of the Reservoir shall not exceed Rs 300/- This is in accordance with Paragraph 12 of your letter no $\frac{48}{D}$, dated the 18th January 1896, and clause 9 of the memo of conditions attached thereto.

3. The Government of India have accepted the proviso to clause 3 (d) added by the Durbar but it had been stipulated that when the Maharaja does not desire to join in the improvements thought necessary by the British Government His Highness shall give all facilities and assistance for the acquisition at a reasonable price of inhabited villages and cultivated lands and for the erection of all works deemed necessary by the Secretary of State.

4. As regards clause 5 the Government of India prefer the word "deterioration"

as it expresses the intention of the Cl
whereas the word "deficiency" sugg
-by the Durbar does not.

5. The agreement as now drafte
Seem to render any further discussi
of the water supply scheme unnec
and in the interests of the Civil an
military station, especially in or
to obviate the lapse of any por
of the allotment for the current year I
am to ask you to be kind enoug
to return both drafts duly si
at the earliest possible date.

I have the honor to be,
Sir,
Your most obedient Servant

K. S. Cokine Capt.
First Assistant to the Resident.

88

(1)

Urgent

Camp No. 47 Enc: 2.

From

The First Assistant to the
Resident in Mysore

To,

The Dewan of Mysore

Dated Lingadhalli 22nd Jan 97

Sir,

A Copy of your letter No 32D of the 3rd December 1896 and enclosures regarding the draft agreement relating to the Supply of water to the Civil and Military Station of Banga-lore having been forwarded to the Government of India for con-sideration, I am now directed to forward an agreement in duplicate and to request that, if approved by the Durbar, it may be duly executed by you "for and on behalf of His Highness the Maharaja".

2. The Amendments suggested to His Highness's draft agreement are explained in Paragraph 2 of the Chief Commissioner's letter No 1 dated 2nd January 1897.

ed to Her Highness's draft Report-ised agreement which in every respect meets the wishes in which it was asked for modification. And finally approved, at once executed as requested.

Resident
for
January 1897.

mitted
Jan 97
2nd J.A.C.

proved
2nd KVS
27.1.97

The Dewan
2nd J.A.C
27.1.97.

by the Durbar have generally been accepted by the Government of India. As regards Clause 3(b) it has been considered necessary to add the proviso that the monthly Cost of the Establishment entertained for the maintenance and Conservancy of the Reservoir shall not exceed Rupees 300/- This is in accordance with Paragraph 12 of your letter No. 48/D dated the 13th January 1896, and Clause 9 of the Memo of conditions attached thereto.

3. The Government of India have accepted the proviso to Clause 3(d) added by the Durbar but it has been stipulated that when the Maharaja does not desire to join in the improvements thought necessary by the British Government His Highness shall give all facilities

and

and assistance for the ac-
-quisition at a reasonable price
of inhabited villages and culti
-vated lands and for the erection
of all works deemed necessary
by the Secretary of State.

4. As regards clause 5 the
Government prefer the word
"determination", as it expresses
the intention of the clause where
-as the word "deficiency" as
suggested by the Dunbar does not.

5. The agreements as now draft-
-ed seem to render any further
discussion of the water supply
Scheme unnecessary and in the
interests of the Civil and Military
Station, especially in order to
obviate the lapse of any portion
of the allotment for this year (Current) I
am to ask you be kind enough
to return both drafts duly signed
at the earliest possible date.

I have the honor to be
Sir
Your most obedient servant
Sd K. D. Erskine Captain
First Asstt to the Resident.

(21)

41 D Bangalore, 29th January 1897

Despd 29th

To,

The Resident in Mysore

Sir,

I have the honor to acknowledge the receipt of Residency letter Camp No: 47 dated Lingadhalli 22nd January 1897 and to return herewith duly executed sanad for aid on behalf of His Highness the Maharajah of Mysore the two copies of the [illegible] Khan

with received regarding
the Water supply of
the Civil and Military
Station of Bangalore

I have &c.

Dewan.

(2)

No 41/D of Bangalore 29th January 1897
Dispd 29th

To,

The Resident in Mysore

Sir,

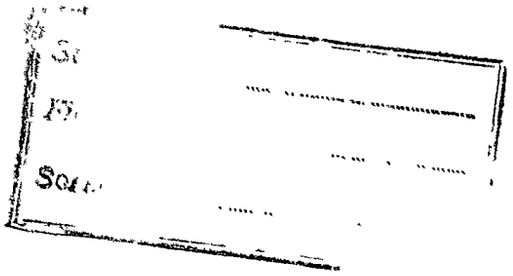
I have the honor to acknowledge the receipt of Residency letter Camp No: 47 dated Lingadhalli 22nd January 1897 and to return herewith duly executed by me for and on behalf of His Highness the Maharaja of Mysore, the two copies of the Draft Agreement therewith received regarding the Water Supply of the Civil and Military Station of Bangalore.

I have &c.

K S

Dewan.

1897 (22)



To

The Secy
D.P.W.

No 79 En 3.

Dt 9.2.97

Sir,

I am directed to forward herewith for information and record in your office a copy of Residency letter No. C.47 dt the 22nd Janry /97 and of this office letter No. 41/D dt the 29th idem in reply thereto, together with a copy of the Agreement executed by the Dewan for and on behalf of H.H. the Maharaja regarding the Water Supply of the C & M Station of Bangalore.

I have etc

8/2/97

for Secy.

(4)

G.

1897

To,

The Secy.

H.C.W

Sir,

I am directed to forward herewith for your information and record in your office a copy of Residency letter No C-47 of the 22nd Jan.y/97 and of this office letter no 41/D of the 29th idem in reply thereto, together with a copy of the Agreement executed by the Dewan for and on behalf of H.H. the Maharaja regarding the Water Supply of the C & M Station of Bangalore

I have &c

(Sd) [illegible]

8/2/97

for Secy

encl No 79 En: 3

of 9.2.97

(23 OFFICE OF THE 7452 6-3-97 P-916. 189

From The 1st Asstt: Resdt

To

The Secretary to the Govt. of Mysore,

_____ Dept.

Dated 5th March/97

Despatched

Received

General No. 907
No

Enclosure No. 1

Returning duly executed by the Govt of India a copy of the Agreement providing for a water supply for the Cantonment of Bangalore

References to be marked

No. 907 Enc (23)

FROM

THE FIRST ASSISTANT TO THE RESIDENT IN MYSORE.

To

The Dewan of Mysore

Dated Bangalore, 5th March 1897.

SIR,

With reference to your letter No. 41/D dated the 29th January 1897, I am directed to return duly executed by the Governme of India a copy of the agreement provd for a water Supply for the Cnt and Military Station of Bangalore

I have the honor to be
Sir,
your most Obedient Servant

[illegible] Captain
1st Assistant Resident

HP

Read.

Letter No. 907-24 dated the 5th March 1897 from the First Asstt to the Resident in Mysore, forwarding duly executed by the Government of India a copy of agreement providing for a water supply for the C & M Station of Bangalore

(Here enter the agreement)

Lr No. 403-6
dt 13-3-97

Order

That a copy of the agreement referred to be communicated to the Secretary, D.P.W, the Comptroller, the Municipal Engineer, Bangalore and the President, Bangalore City Municipality for information and guidance

B

Sd

DPW
Comptroller, Bangalore
Municipal Engineer, Bangalore
City Municipality

12. The question of providing a permanent Water supply for the Civil and Military Station of Bangalore having been definitely settled by the Agreement quoted above, the Dy Commr of the Bangalore District is now requested to return to the original owners all the lands, houses and other buildings taken up for the Malgal Scheme, recovering as much of the compensation paid therefor as possible. The Dy Commr should report at an early date on the action taken by him in the matter.

Secy

Dy
A perusal
will make
agreement
referred
State

above
submit definite
proposals as
regards the date
of the cancel
for the
Scheme.

13/3/19

Proceedings of the Government of Mysore, General, dated 13th March 1897.

READ

Letter No. 907, dated the 5th March 1897. from the First Assistant to the Resident in Mysore, returning duly executed by the Government of India, a copy of agreement providing for a water-supply for the Civil and Military Station of Bangalore

---

No. 403—6, DATED CAMP MYSORE, 13TH MARCH 1897.

ORDER THEREON.—Ordered that a copy of the agreement referred to above be communicated to the Secretary, Public Works Department, the Comptroller to the Government of Mysore, the Deputy Commissioner, Bangalore District, and the President of the Bangalore City Municipality, for information and guidance.

2. The question of providing a permanent water-supply for the Civil and Military Station of Bangalore having been finally settled by the agreement quoted above, the Deputy Commissioner of the Bangalore District is now requested to submit at an early date definite proposals as regards the disposal of the lands acquired for the Maligal Scheme.

Secy. to Govt., Genl. & Rev. Depts.

To—The Secretary, Public Works Department
" Deputy Commissioner, Bangalore District
" President, Bangalore City Municipality
" Comptroller to the Government of Mysore with a request that he will have the agreement duly secured in the State Huzur Treasury

GOVERNMENT OF MYSORE

GENERAL

PROCEEDINGS

Dated 13th March 1897.

Camp No. 403—6

Communicating copy of the agreement providing for a water-supply for the Civil and Military Station of Bangalore and requesting the Deputy Commissioner, Bangalore, to submit definite proposals regarding the disposal of lands acquired for the Maligal Scheme.

Government Branch Press, Mysore.—15-3-97.—120.